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Price Differential and Selling Policy

At one period in our life we habitually bought the "Three Castles" brand of cigarettes, which cost 33 per cent. more than Players. Nowadays, the differential is less than 10 per cent., owing to the basic increase in prices of the two brands. Something of the same sort has been happening in the castings industry during the same period, except that all types have maintained if not enhanced their quality. The price levels of iron and steel castings have been closing, and this favours the easier sale of the more expensive material where service demands can be satisfied by either. This argument also applies to the light alloys, and die castings. The recent advance in the price of scrap and pig-iron will again favour the use of the higher-priced material as once more the margin will be narrowed.

However, price is not the sole factor in the selling of castings, but rather it is their ability to meet the specifications laid down by the consumers. The general reason for using castings, is that they represent the shortest route from the raw materials to the finished article, and because of this factor they will always find favour with the engineer-designer. He, however, like other buyers, needs to be periodically "jolted" to get him to take advantage of the newer materials. For instance, the properties of the new nodular or ductile cast iron open up new fields. These irons, as is well known, have tensile properties, after a short heat-treatment, something akin to certain types of malleable. The "Iron Age" for February 17 carries an article emanating from the technical staff of the International Nickel Company, which shows that the growth-resisting properties are of major interest. Tests carried out at 870 deg. C. showed a percentage growth of 2.1, as compared with 2.8 for a chrome-nickel and 12.1 per cent. for ordinary cast iron. The depth of oxide penetration was also at a minimum. This type of test impresses us more than the postulation of the tensile properties because, for so many applications of materials as castings, the latter are not so very important. Machineability, wear resistance, rigidity, resilience and a host of other properties, usually difficult to designate in universally-accepted digital units, are amongst the properties more sought after by the engineer. If it were but a question of excellent tensile properties, then the makers of steel castings would "scoop the pool."

Serious efforts must be made to examine one's products objectively, in order to ascertain their place in the future scheme of affairs. The narrowing of price differentials owing to inflationary impacts; the developments in competing lines, such as the line-production of weldings, using automatic machines; and the use of steel pressings for domestic appliances are all potentially dangerous competitors. As buyers become more "choosy," the casting salesman must have in his armoury, not merely lower prices and quicker delivery, but materials of such technical worth that they will enable the customer to carry out a like policy, when his turn comes to sell. It must be borne in mind that he, too, is, or soon will be, worrying about the attenuation of differentials between his and his competitors' selling prices. Though we have broken the rules of good journalism by going from the particular to the general, for which we apologise, yet testing and re-testing by reference to commodities other than cigarettes invariably discloses the same tendency.

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Scottish Foundry School

The Director of Education submitted a letter to Stirlingshire Education Committee recently from the National Light Castings Ironfounders' Federation referring to a meeting of the Joint Advisory Committee set up to administer the Burnbank Foundry School, Falkirk, when it was agreed to proceed with the training of apprentices in the area at that school.

The letter stated that in order that the scheme of training apprentices at the school could be undertaken, it was necessary that firms in the area should agree to release their apprentices for attendance at the school for one day or two half-days per week, and it was suggested that firms should pay their apprentices their appropriate all-in time rate for the day per week spent at the school. The proposal had been considered by the Federation members in the area and had received their approval. Of the ironfounders who contributed towards the purchase of Burnbank Foundry School, there were two firms who were not members of the Federation. The proposal had also been communicated to the two non-federated firms, one of which had intimated its approval, but no reply had yet been received from the other firm.

It was hoped that the agreement of all but one of the interested ironfounders would enable the scheme of training apprentices in the area at the school to be proceeded with. The Director of Education reported that he had telephoned the Scottish Education Department intimating the approval of the employers to the release of their apprentices to enable them to attend the Burnbank Foundry School. He added that the Education Department would now require to collaborate with the Ministry of Labour with regard to a training scheme for the apprentices attending the school.

Technology and Operational Research

The First Report of the Committee on Industrial Productivity contains the following paragraph on the foundry industry:—

Another industry mentioned by the Economic Planning Board was the foundry industry and the Panel has given some consideration to this, particularly to iron foundries. After the original statement was received from the Economic Planning Board the situation changed somewhat in the industry and the supply of raw materials, particularly of pig-iron, became the principal limiting factor. This restricted the opportunities for obtaining increased productivity. There seems little doubt, however, that a large part of the industry is capable of improvement, both as regards technical equipment and lay-out, and as regards general working conditions. Any large-scale re-equipment, such as the introduction of automatic moulding machinery, would necessitate considerable capital investment which presents particular difficulty at the present time. Nevertheless, a considerable number of schemes for modernisation have been put forward by

Continued at the foot of column 2.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

APRIL 12.

Institution of Works Managers

London Branch:—Half-day Conference: "How Money Moves in a Business," by T. G. Rose, at 12.30 p.m., at the Waldorf Hotel, Aldwych, London, W.C.2.

West Midland Branch:—"Human Aspects in Management Efficiency," by Lt.-Col. R. A. C. Radcliffe, at the Grand Hotel, Birmingham, at 7 p.m.

Institution of Mechanical Engineers

Discussion on "Fatigue Strength of Cast Crankshafts," by H. R. Mills, Ph.D., B.Sc.(Eng.), and R. J. Love, Wh.Sc., at Storey's Gate, St. James's Park, London, S.W.1 (see page 318 of this issue).

Institute of British Foundrymen

Slough Section:—Annual General Meeting, followed by film "A.1 at Lloyds," in the Lecture Theatre, High Duty Alloys, Limited, at 7.15 p.m.

Institution of Production Engineers

Wolverhampton Graduate Section:—"The Manufacture and Application of Sintered Carbides," by Dr. E. M. Trent, at the Wednesbury and Staffordshire Technical College, at 7.15 p.m.

APRIL 13.

Institute of Vitreous Enamellers

Southern Section:—"The Reclamation and Re-application of Waste Enamel," by E. Williams, at Charing Cross Hotel, London, W.C.2, at 7.15 p.m.

APRIL 14.

Institute of Welding

North London Branch:—Annual General Meeting and Film Night, at the Fyvie Hall, Polytechnic, Regent Street, London, W.1, at 7.30 p.m.

The Institute of British Foundrymen.

East Anglian Section:—Annual General Meeting, followed by "Brains Trust," at the Central Library, Ipswich, at 7 p.m.

Institution of Works Managers.

Wembley Sub-Branch:—"Practical Motion Study," by I. H. Child, at the Rest Hotel, Kenton, at 12.30 p.m.

APRIL 15.

Institute of British Foundrymen.

Middlesbrough:—Annual General Meeting, at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough, at 7.30 p.m.

The "Garrett" Report

Two misprints occurred in the article carrying the above caption which was printed in page 292 of our last issue. The nineteenth line onwards should read, "Some idea of the progress achieved is indicated by a well-chosen series of photographs, and it may be that they will give rise to the invention by operatives of further types of labour-saving devices or in other respects, more efficient plant."

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the industry and substantial progress has been made. The need for better buildings, amenities and working conditions has been stressed in the report of the Joint Advisory Committee on Conditions in Iron Foundries (Garrett Report), and a Joint Standing Committee has been set up under the chairmanship of the Deputy Chief Inspector of Factories to discuss the implementation of their recommendations. In this sphere also, the necessity for a considerable building programme inevitably restricts progress.

Casting Inspection*

How a Modern Need for the Maintenance of Quality in Castings is achieved.

By J. Howard Williams

INTRODUCTION

This article is composed of a number of opinions, descriptions of methods, criticisms, *etc.*, relative to many aspects of casting inspection in the small general foundry, where high-grade metals and intricate precision castings are produced in small or medium batches; it does not attempt to cover problems peculiar to mass production in fully mechanised foundries. The foundry where the Author is in charge of casting inspection produces castings in high-duty iron, steel and non-ferrous metals, the major portion of castings produced being pressure-tight, shock-resisting and extensively cored. The metal referred to more particularly is high-duty iron, but, in general, the methods outlined are applicable equally to inspection of steel and non-ferrous castings.

On steel, the use of inspection picks is not as effective as on cast iron and, if used indiscriminately, will disfigure the castings. Close observation before and after removal of runners and risers, the use of comparative weight method on suitable batches, and the discreet use of the pick will be found quite effective in most cases. The inspection of non-ferrous castings is similar to that of steel, except that on metals of low specific gravity, such as aluminium, the comparative weight method is obviously useless.

The writer's habit of varying his style from that of the usual "Technical Article" to the "Humour-*cum*-Sarcasm" type is to stress certain points; facts stated in humorous or unusual ways are often better remembered; it is certainly not his intention to hold foundry troubles up to ridicule; they are no joke to those concerned.

Aims and Results of Casting Inspection

Aims:—

(1) To raise the standard of quality of all castings produced to the highest possible level. To eliminate that lack of faith in the reliability of iron castings which has caused so many designers in the past to use the more expensive steel castings, or fabrication methods. This mistrust of castings is caused by failures which have occurred, and these are mainly due to three reasons:—(*a*) Lack of efficient foundry control, especially of furnace and metallurgical sections; (*b*) lack of honest, efficient casting inspection, and (*c*) the practice in most foundries in the past, and in many at present, of pursuing a "penny-wise, pound-foolish" policy, known by them as "rectification of bad castings," but which should be known for what it actually is—in many cases, deliberate deception of the customer.

(2) To keep down foundry scrap percentages by the prompt reporting of *all defects* to the foundry foreman, whether scrap castings are the result or not. Inspection records are a great help in scrap prevention (to be further dealt with later).

(3) To prevent loss of time and money to customers by rejecting in advance any castings which would eventually be scrapped after machining.

(4) To maintain an unbiased relationship between customers, management and foundry; this relationship is often somewhat unpopular in the foundry, being regarded as a form of "tale bearing," but ultimate results are beneficial to all, for, obviously, minimisation or concealment of foundry troubles always *raises* scrap percentage.

(5) To protect, and possibly improve, the foundry's reputation, and by the same methods protect the customer's interests.

(6) To foster a spirit of co-operation between the foundry staff and the inspector, until this is achieved the full value of inspection cannot be fully appreciated, as it should be, by the foundry.

Results:—

(1) Undoubtedly, the quality of production is raised in many ways. For instance, moulding faults promptly reported to foundry foreman are even more promptly attended to by those concerned; the careless, inefficient or indifferent moulder is shown the error of his ways, in time to prevent more scrap from the same cause, whilst the good, conscientious moulder becomes even more anxious that no faults appear on his work in the future.

(2) The impression is prevalent to some extent in most foundries that thousandths, thirty-seconds, and even sixteenths of an inch are applicable only to machine-shop practice. The idea that the inspector has set hopelessly high standards of accuracy, which are not practicable in a foundry, is gradually replaced by a reasonable amount of respect for precision.

(3) When casting inspection is first introduced in a foundry, the standard of inspection should always be raised gradually, otherwise the results can be disastrous to the foundry's economics. The results of raising the standard of quality to the correct level are interesting; at first, scrap percentage goes up, quality shows little change for the better, and production falls slightly; then, after a reasonable lapse of time, scrap percentage goes down to reasonable levels, standard of quality goes up to approximately the desired point, and production increases. The peculiar final result is that, by raising the scrap figure in the first instance, inspection eventually lowers it.

(4) A customer's confidence is greater in the quality of castings received from a foundry where the casting inspection is known to be efficient and reliable.

*A Paper forming the basis of a lecture to the Wales and Monmouth Branch of the Institute of British Foundrymen, Professor Jones presiding. The Author is Castings Inspector with Holman Brothers, Limited, of Camborne, Cornwall.

Casting Inspection

Difficulties Relative to Introduction of Casting Inspection

The first two difficulties which occur when casting inspection is introduced into a foundry are matters which are the concern of the management. They are:—(*a*) Selection of a suitable place for inspection department, and (*b*) choice of someone to take charge of casting inspection.

(*a*) The inspection department should be as close as possible to the fettling department, but not part of it; conditions in the average fettling shop would make first-class inspection an impossibility. The inspector must make frequent visits to the fettling department, however, if he does his job thoroughly. Some faults can be detected easily before risers and runners are removed, which would be difficult to discover afterwards; also, faulty castings can often be detected before or during the fettling operation, thus preventing time being thrown away on the cleaning of wasters. When the castings have been fettled, they must then be sent to the inspection department, where the final foundry inspection takes place. Lighting, tools, space and conditions in general in the inspection department must be of a high order to produce the desired standard of inspection.

(*b*) The manager's next task—the selection of a suitable person to take charge of inspection—is no sinecure. He must choose someone with sufficient experience and ability, also one having a suitable personality; in fact, the ideal embryo inspector. The giving of the job to a person because he was partly disabled, old, or otherwise unfit for active work would be a serious mistake, unless that person were fully qualified to take the post.

The inspector is usually chosen from either the machine shop or the foundry, and in either case he has a fairly extensive knowledge of his own branch of engineering, but, as a rule, a surprisingly small knowledge of the other. He must acquire a fair knowledge of the unfamiliar side of his new job as quickly as possible, and as this will take some time, he will certainly make many mistakes; he will probably notice signs of "unholy joy" in certain quarters every time he makes a slip.

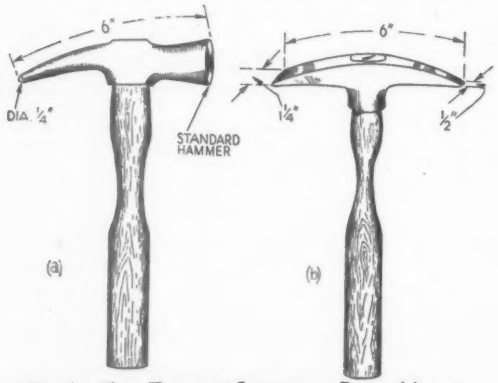

FIG. 1.—TWO TYPES OF INSPECTION PICK: (*a*) WITH CENTRE-PUNCH POINT, (*b*) WITH DOUBLE-CHISEL EDGES.

At this stage in the inspector's career the understanding and constant support of the management is essential, or he will probably become discouraged and lose interest, or, worse still, lose his self-confidence and become dominated by, and more or less under the control of, the foundry foreman. A casting inspector who is biased for, or against, the foundry, or who can be influenced in making his decisions by biased persons, must either be cured of his weakness or be replaced without loss of time. The first 6 to 12 months of casting inspection are not pleasant; the inspector will find he has to learn in a "hard school."

In the first six to twelve months he will certainly encounter such troubles as:—(1) Frequent attempts at "inspector blinding" by the foundry and fettling departments and, until he benefits by experience, many such attempts will be successful; (2) personal animosity, open or underhand, in many cases from the foundry personnel. At the best, he will be regarded as an unnecessary nuisance, foisted upon the long-suffering moulders by a manager whose ideas are "new fangled" to the point of being silly.

If the new inspector hails from the machine shop, he will find the foundry personnel will treat him as one who must be humoured a little because of the job he holds, but they will plainly show their opinion of his abilities, and their little respect for his decisions relating to foundry faults; in fact, their obvious condescension and sense of superiority will be a "pain in the neck" to the inspector for some time. If the inspector be chosen from the foundry, he will find his actions regarding casting faults found in the machine shop are criticised as showing bias in favour of the foundry, and little knowledge of machine-shop practice; as there will probably be an element of truth in these criticisms, the best thing the inspector can do is listen to the critics and, in both cases, learn from them. When anyone "shows off" his superior knowledge on some point, by correcting a statement or action on the inspector's part, the inspector should be duly—but not audibly—grateful; on that point at least his knowledge becomes no longer inferior.

The inspector chosen from the foundry will discover that the majority of moulders will develop a remarkably vivid memory regarding the inspector's mistakes in the past, and will show no hesitation in audibly comparing the inspector's own past wasters with those he now scraps from his erstwhile workmates. One surprising fact will emerge from this: apparently all the inspector's past mistakes were "whoppers" and the castings were deservedly scrapped, but the castings he now scraps daily are mainly good ones, or very nearly so. All these, and many more forms of irritation, will trouble the inspector, and to some extent make his life a misery if he is at all sensitive; his only remedy is to develop a

metaphorical skin comparable to that of the rhinoceros.

One common mistake, which all casting inspectors are likely to make in the early stages of their careers, is that of being unwisely sympathetic towards the foundry's troubles. This statement would probably be described as a "colossal terminological inexactitude" by most foundrymen (but in other words!); however, the Author has made this mistake several times in the past, so he should know. At times scrap will come from the foundry like an avalanche—nothing seems to turn out right. The foreman is obviously worried, and the inspector naturally feels sorry for the foundry's misfortunes. The inspector's mistake occurs when he passes defective castings in a well-intentioned attempt to "save something from the wreck," but his mistaken ideas are soon made clear to him when the castings are returned as scrap from the customer!

The amount of sympathy the inspector gets from the foundry, when he is criticised by the manager regarding abnormal returns from the customer, is rarely noticeable. The foundry's opinion regarding "border-line" defective castings is invariably, "Try it on the customer; it may be all right." But this idea is fatal to good inspection. It will be found that passing castings which are "risky" will reduce foundry scrap percentage a *little*, but will raise the percentage of returns from the customer *considerably*. As the financial loss on machined scrap is often 10 times as much as on foundry scrap, it is obviously a mistake to take many risks.

After the inspector and his department have passed through their period of primary troubles, as outlined in the preceding paragraphs, it should then be the aim of the foundry, in co-operation with the inspection department, to reduce scrap to ideal figures; in the average foundry envisaged by the Author, these would be approximately 5 per cent. foundry scrap, and 1 per cent. or less returns from customers, due to bad castings. As 80 to 90 per cent. of the 1 per cent. returns from customers are faults which it is not possible to locate during normal foundry inspection, returns from customers will not be kept down to 1 per cent. without constant, unremitting care on the inspector's part.

The Author has found from experience that if foundry scrap is allowed to rise to an appreciable extent over a period, the returns from customers will also rise, roughly in proportion, thus: foundry scrap, 5 per cent.; customers' returns, 1 per cent.; foundry scrap, 15 per cent.; customers' return 3 per cent. This is, of course, just the law of averages; approximately the same proportion of total scrap castings cannot be detected in the foundry inspection department, so it is in the inspector's own interest to help keep down foundry scrap by any means in his power. The inspector must always remember, however, that accepting castings which should be scrapped is not a method of keeping down foundry scrap—that is merely asking for more.

Qualifications for an Inspector

The inspector should possess the following qualifications:—(1) Knowledge of foundry practice; (2) knowledge of machine-shop practice; (3) knowledge of ultimate use of all castings inspected; (4) ability to read drawings; (5) ability to mark-off, and measure; (6) he should have very good sight, *and be observant;* (7) he should be tactful, diplomatic and understanding of human nature; (8) he should not allow himself to be influenced against his own judgment, or bullied in any way; (9) he should be absolutely unbiased, and truthful; (10) he should be able to estimate roughly on sight the probable strong and weak points of a casting, and know where weaknesses and faults are most likely to be found; (11) he should be genuinely anxious to use any

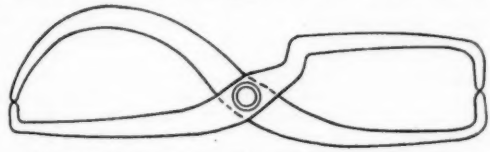

FIG. 2.—DUPLICATING CALIPER, 2 FT. 6 IN. LONG.

knowledge he may possess to help the foundry and *not* use it as a means of "showing-off," and (12) he must be absolutely impervious to nasty remarks, *etc.*; the only way in which his skin should be pierced should be by showing him a bad casting he has passed.

These qualifications may be further elaborated, *viz.*:—

Nos. (1) *and* (2).—The inspector's knowledge of one of these is certain to be limited by lack of practical experience; he must constantly endeavour to improve his knowledge of the weaker subject.

No. (3).—This requires experience, access to drawings, contact with customers, a fair knowledge of engineering practice in general, and *sense enough to ask questions* when he is doubtful on any point, the inevitable result of covering his ignorance by bluff being obvious.

Nos. (4) *and* (5).—An inspector who criticises a casting regarding dimensions, and is not capable of marking-off the casting to prove his point, is at once placed in an untenable position. If an inspector be rash enough to criticise, without being sure he knows what he is talking about, he will promptly run into trouble; the writer is quite sure on this point, having tried it.

No. 6.—Good sight is a natural blessing, essential to all inspectors, but *observation* is an acquired art of which sight is only one part. It is obviously impracticable to check *all* castings at *every* point by gauge, template, mark-off, *etc.*; the inspector must develop his powers of observation until he can, within reasonable limits, check all visible measurements by eye alone. The inspector should be able to measure at a glance any measurement from 1 in. down, within $\frac{1}{16}$-in. limit, the amount of error being greater, in proportion, on bigger measurements.

Such mistakes as "parts of a casting out of alignment," "cores out of centre," "round holes and right angles which are not," and various other dimensional mistakes, should be obvious to the unassisted eye; in most cases measuring tools need only be used to decide

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whether the castings are usable or not. Gas pockets can often be found by close observation of variations of "skin" colour; fractures can often be found by sight alone, but sounding methods, "paraffin and chalk," pressure tests and, in some cases, mechanical tests should also be used where fractures are suspected.

No. 7.—Being tactful is telling a man where he is wrong in such a manner that he thinks he has discovered the mistake himself. In political circles, diplomacy is understood to mean using lies in a good cause, without being caught; the Author's own definition is, roughly, getting the desired effects by telling the truth in such a manner as to avoid "raising Cain." A good understanding of human nature is only acquired by experience, plus a true valuation of one's own weak points. If the inspector can mentally "put himself in the other man's place," he can easily get all the understanding of human nature he is ever likely to require.

No. 8.—Attempts to influence the inspector against his own judgment are fairly frequent, mainly from the foundry, but are not unknown from machine shop or customer. In some cases attempts are made to deceive the inspector, and so influence his judgment, but in most cases those who try to guide the inspector's opinions, honestly believe themselves right, and the inspector wrong. If the inspector is sure his decision is correct, he should prove it to the doubtful one; if it is a "borderline case," and the inspector thinks it best to scrap it, he should not alter his decision; if he does, further attempts to alter his decisions will become painfully frequent; if he is not sure his opinion is correct, he should admit it, and check all doubtful points before making a decision.

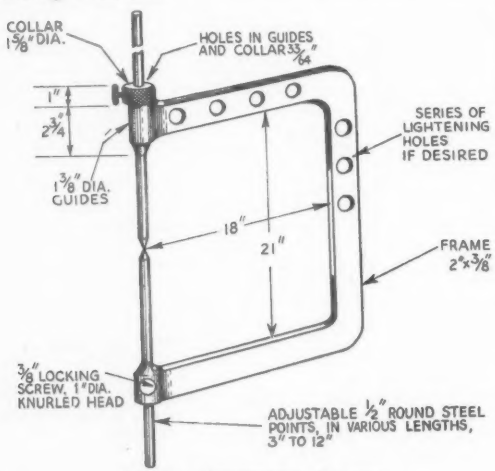

FIG. 3.—ADJUSTABLE CALIPER.

An inspector must have self-confidence, and be strong-minded enough to stand by his decisions, but an inspector who does not realise the vast difference between strong-mindedness and obstinacy will never be an asset to his firm. If the management discovers an inspector is being bullied, he should be helped, but if bullying continues and the inspector is weak-minded enough to give way to it, get rid of both the bullied and the bully; neither is likely to be an asset in a progressive foundry. If the management knows of pressure being brought to bear on the inspector, and "wink at it," they will get the type of inspection they deserve.

No. 9.—Telling the truth without fear or favour at all times is the only possible way to carry on the inspection business, even if it hurts the inspector at times, but this habit does not always add to the inspector's popularity. Being unbiased is a state of mind which should be the aim of all inspectors; but if this be ever perfectly attained by an inspector (or anyone else), the development of wings and a halo would be a natural sequence.

Tools Required

The three "P's," Pick, Paraffin and Perception, will be found all that are necessary in the major portion of general casting inspection, but many other tools will be found useful on specialised details of inspection.

Inspection Picks.—The inspection picks generally used have a point resembling that of a centre punch, and weigh from 1¼ to 1¾ lb.; the Author also finds a double-ended chisel-edged pick is often useful, one end approximately 1¼ in. wide, the other ½ in. (see Fig. 1 (*a*) and (*b*)). An inspection pick in the hands of an inexperienced person is likely to do serious damage to castings, particularly in relation to appearance. After making the casting look like a "small-pox case," he will still often fail to find the faults actually present. The pick-user *must* be familiar with the following points:—(1) Which part of the casting is on the top when it is poured—that is, where almost all gas cavities, slag, loose sand and other troubles are to be found, many concealed by a thin layer of metal; (2) where the casting is to be machined, and where it is not—when necessary the pick can be used freely and heavily on surfaces to be machined, but light blows and discretion must be used on non-machined surfaces; and (3) variations in skin colour of castings are a most useful guide when "picking."

The chisel-edged pick is most useful on castings with a narrow top edge, which would often be missed by the centre-punch type; it is also better in many cases than the method using a hammer and chisel for inspection purposes, as it leaves one hand free for other things, such as steadying the casting.

Use of Paraffin.—An ordinary oil can, fitted with a pump, is, in the Author's opinion, one of the most essential aids to castings inspection. This can is used for squirting paraffin on to any part of a casting where the inspector has reason to suspect the possibility of leakage. The majority of castings which have to be pressure-tight are cored, and often the cored cavities are numerous; also, some parts of the cored spaces are

difficult or impossible to see. When testing for suspected leaks, it is necessary to apply the paraffin freely on the inside of the casting, to rub in some chalk on the outside and, after a suitable lapse of time, to examine the chalked surface. If a leak be present, a dark stain on the chalk will reveal its position and extent. The use of paraffin when testing rough castings can be relied upon to reveal practically all leaks which would be found by a hydraulic test; yet the process is much quicker, cheaper and requires none of the gear normally used for pressure testing; also, the difficulty in making pressure-tight joints on rough castings is entirely avoided.

Testing for leakage due to porosity on rough castings, whether by paraffin or hydraulic test, is largely a waste of effort; a hole must have two open ends to qualify as a leak, and second end of holes, due to porosity, are not usually opened except by machining.

Double-end Calipers

A double-end caliper, which gives duplicate measurements at each end, is an indispensable inspection tool; actual size and shape of this tool is, of course, dependent on the size and types of castings generally inspected.

Uses of Tools

The caliper chiefly used by the Author, shown in Fig. 2, is approximately 2 ft. 6 in. long, each leg being of a different shape, and it is practically indispensable for checking thicknesses; it is well known in the Author's foundry as "George Washington."

Another tool of the caliper type is shown in Figs. 3 and 4. It has been designed by the Author and is very useful for checking thicknesses on curves, angles and a variety of other places where measurement by other means is impracticable.

For measuring a dimension, the following procedure is adopted:—(1) Referring to Fig. 4, slide point (B) through the $\frac{23}{64}$-in. hole in the frame until the point projects far enough to let the frame clear the casting, then lock point (B) in position by tightening the knurled set-screw (C) (2) Hold point (B) at the position where the measurement is required, drop point (A) through the hole in frame until it touches the casting (with the collar sliding freely) and, when satisfied that the points are making proper contact with the casting surface and the sliding collar is resting on the frame at point (E), lock the collar in position by tightening the knurled set-screw (D). (3) grip point (A) at the position (F) and pull the point out of the frame until the calipers can be removed from the casting; push point (A) back into the frame until the collar is again resting on point (E), measure the distance between the points, and the process is finished. Many other uses and variations of this tool will be obvious to any inspector. The actual size of the tool must be determined by the size of castings generally inspected; the approximate dimensions on Fig. 3 are of one used by the Author, which has earned the name of "George, Senior"—rather a compliment.

Templates, gauges, *etc.*, necessary in casting inspection are of infinite variety and could hardly be described

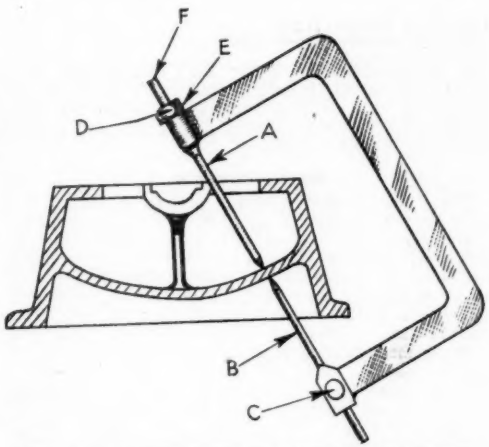

FIG. 4.—METHOD USING THE ADJUSTABLE CALIPER (SHOWN IN FIG. 3) FOR CHECKING THE THICKNESS OF A CURVED SECTION IN A CRANKCASE CASTING.

in a general sense, but the quality of a foundry's production in respect to precision can be fairly accurately assessed by the amount of use of, or lack of, precision testing. Where castings are mass produced, the use of expensive jigs and gauges makes casting inspection a fairly simple job, as far as dimensional checking is concerned. Unfortunately for the inspector in foundries which only produce small batches, the use of such mechanical aids to inspection is not economically feasible to any great extent; therefore, he must depend largely on his own skill and observation, coupled with efficient use of such tools as rules, calipers and surface plates, for mark-out checks.

The precise measurement of jig points by some form of gauge is essential if trouble in the machine shop is to be avoided; the frequent, almost universal, omission of information on drawings, regarding position and dimensional limits of jig points on castings is often the main primary cause of failure of castings to fit jigs. If the casting inspector knows where a casting contacts the jig, and the relevant dimensional limits, it is a simple matter to provide gauges, which will effectually prevent complaints from the machine shop.

Lighting

Good lighting, both daylight and artificial, is a recognised necessity in the inspection department; lights for special purposes used by the Author are: an adjustable bench light, which is also portable within limits; and, most important of all, a small but powerful light with an adjustable shade, which directs the light where it is required and prevents dazzle (see Fig. 5). This light is mounted on either a flexible or rigid tube approximately 1-in. dia. by 2 ft. 6 in. long. It is indispensable when examining the interior of many castings,

Casting Inspection

and is immeasurably better than wax tapers. The range of portability is only limited by the length of the connecting lead attached and its small diameter, plus its flexibility, make it an easy matter to insert it into almost all cored cavities.

Relative Weights

The "comparative weight" method of finding invisible cavities in castings up to 40 to 50 lb. in weight is a simple job, but the need for this method on iron castings is rare; on steel castings its use is likely to be more frequent. A double-tray balance, suitable for weights up to 56 lb. and showing ¼ lb. light or heavy on the dial, is the most suitable apparatus for the job. The method used is to place a casting on each tray and compare their weights; after a few comparisons from a batch of about a dozen, the heaviest casting is selected. This is placed on the back tray, and then the entire batch is passed over the front tray, chalking amount by which it is light on each one. The weights of the lightest and heaviest of the batch of castings may be compared and the difference in weight expressed as cubic inches may be calculated. If this be sufficient to be dangerous, the lightest casting may be sectioned on a machine hacksaw, or other suitable machine, until the fault is revealed. It is then a fairly simple matter to decide how many of the batch must be scrapped, by referring to the weights marked on each. This method would only be used in inspection if there were reason to suspect the presence of concealed cavities, probably shrinkage or gas-holes; it should not be classed as routine inspection. There are many indications which may give rise to suspicion; such as: information received by contact with the customer or the machine shop regarding cavities which have been revealed during machining earlier castings; inspector's observation of risers at a pre-fettling stage (these may possibly be of unsuitable size, shape or height, making presence of "shrinkages" likely); observation of signs of possible shrinkage on the exterior of the castings; and signs of gas-holes or even oxidation of the metal.

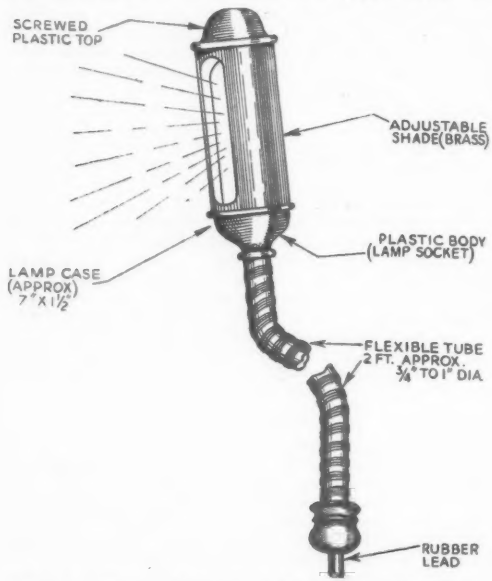
SCREWED PLASTIC TOP
ADJUSTABLE SHADE(BRASS)
PLASTIC BODY (LAMP SOCKET)
LAMP CASE (APPROX) 7" X 1½"
FLEXIBLE TUBE 2 FT. APPROX. ¾" TO 1" DIA.
RUBBER LEAD

FIG. 5.—SHADED INSPECTION LAMP WITH FLEXIBLE ATTACHMENT.

A surface plate is a necessary part of equipment, and should be of a size to accommodate the biggest casting which the inspector is likely to check dimensionally. This is used for checking the first casting off a new pattern, or altered pattern. It is also often used to check the precise amount of error when some dimensional mistake, such as incorrect core position, has been observed during visual inspection.

Machine Tools for the Inspectorate

Some machine tools are suitable for inspection purposes as well as for some fettling operations. The Author uses a radial drill, a large shaping machine, a machine hacksaw and a twin-wheel pedestal grinder. As all these machines were retrieved from the scrap pile after being discarded by the machine shop, the cost to the foundry was practically nothing. If the foundry has to wait for reports from customer or machine shop as to faults in castings, there is an inevitable time lag, during which either production must be suspended, or the risk of producing large quantities of scrap must be taken. In many cases, experiments carried out on the machine tools in the inspection department will clearly prove whether or not casting technique is suitable within a few hours of a casting being made.

The machine tools listed can be used for a variety of purposes. For instance, the *drill* can be used (1) for testing for porosity which is not visible on the surface, but which, for some reason, the inspector suspects to be present; and (2) for drilling and tapping holes for plugs. If the inspector deems a defective casting can be salvaged by plugging, there are several reasons why this job should be done under his supervision. Sometimes a defect is apparently easy to plug, but more or bigger defects are revealed after drilling, possibly serious enough to scrap the casting. The inspector must also be sure that the plug is correctly put in and ground-off flush with casting to preserve the appearance, and then he should test it with paraffin for any leakage. In general terms, no casting should leave the foundry inspection department which is known to be defective in any way. (3) the drill may also be used for doing urgent repairs for the foundry, where the normal procedure of sending the work to the machine shop would take too long; or (4) for drilling a series of holes across the "neck" of heavy risers, after which they can be knocked off with ease. This method prevents "pulling out" a

portion of the casting immediately under the riser or the possible fracture, and consequent scrapping, of the casting. Such a method also prevents excessive perspiration on the part of the sledge-hammer expert. Use of the "Cameron Core" is gradually cutting down the amount of drilling needed, but unless all casting conditions are near perfect, the "Cameron Core" method is likely to give trouble in some ways.

The *shaper* is used for cutting castings in various ways, to reveal the amount and position of porosity, shrinkage, *etc.*, which may be present. When the nature and position of the trouble is definitely known, the fault is usually corrected quickly, thus reducing scrap percentage. The shaper is also used for some fettling operations; for example, the removal of riser pads. This considerably reduces the amount of grinding necessary in the fettling department, with consequent improvement in air conditions there. Occasionally a casting which has been strained on a flat face can be salvaged by facing it off to correct dimensions; it is also possible at times to salvage castings which are oversize due to the top box having lifted. Whether such castings should be scrapped or salvaged must be left to the discretion of the inspector, and he must consider three points before making his decision:—(1) The value of the casting in comparison to the expense of salvage; (2) whether the casting will be as good as normal production after salvage; and (3) if the casting is to replace a breakage (or for any other reason it is urgently required), whether the time saved is recompense enough for the cost of salvaging.

The *machine hacksaw* testing of small castings by cutting across sections where faults are suspected exposes incorrect thicknesses, porosity, *etc.*, so clearly that even the most argumentative moulder has little to say. The saw is also used for removing risers, or shrink-bobs, from small and/or fragile castings, thus eliminating the usual percentage of scrap due to breakage in dressing.

The *grinder* is used for sharpening various tools; it is a great time-saver if the toolroom is some distance from the inspection department.

X-ray Inspection

The large initial cost of an X-ray machine suitable for use on cast iron or steel, plus running costs of approximately 2s. 6d. per photo, makes the use of X-rays as a regular inspection process in the small general foundry inadvisable from the angle of practical economics. Considerable experience is needed before an X-ray photograph can be understood and, if the foundry produces armaments or aircraft parts, which have to pass a test which specifies the use of X-rays, the actual testing would have to be done by someone especially employed for that work; the casting inspector would find it impossible to do normal foundry inspection, plus X-ray tests.

Defects can be located in cast iron by the supersonic reflectoscope, but the instrument is so sensitive that it detects microscopic porosity, which makes it of little use for practical routine inspection; also a flat, relatively smooth surface is required on the part being tested—such things are not always found on every casting. Either, or both, these inspection methods may become normal routine in the casting inspection department of the future, but, in the Author's opinion, they are of little practical use to the average foundry at present.

Inspection Records

The value of records in connection with inspection is obvious; the records must provide, quickly and precisely, any information required by the foundry or management, and the information may have to cover a period of days or years. Unless the records are complete, clear and reliable, this is impossible. The following is a description of the methods employed by the Author; they provide all the information required, but avoid making the inspector into a full-time clerk.

First, the description of a casting, or batch of castings, found to be defective, is entered in a rough notebook (usually carried in the pocket), together with the reason why the casting is considered defective. Later, at some convenient time, and after checking by the casting list for such information as "date of casting,"

Date: *Wed.*, 10*th March*, 1948

No.	Description.	Person.	Cwt.	Qr.	Lb.	Defects.
						Scab
3	V 7/1 Cylinder	675	4	3	0	
1	DN.1. Base	433	7	1	10	
						12-0-10
						Bad Moulding
6	V.3 Valve chest cover	414	—	3	20	Top up
1	OS. 14 Crankcase	417	5	0	26	Core shift
2	KV.3. Drum	593	6	2	2	Run out
						12-2-20
	Totals					

FIG. 6.—DAILY SHEET FROM THE FOUNDRY PERMANENT INSPECTION RECORD BOOK.

Casting Inspection

"moulder's number," *etc.*, the details are entered in the permanent foundry inspection record book (see Fig. 6). The defective castings are grouped together under their respective reasons for being scrapped, such as: scab, misrun, and so on. From the information in the record book, it is a simple clerical job to complete the weekly inspection sheet (see Fig. 7), which is made available to all foremen in the foundry, and is used at the weekly foundry meeting. The percentage of defectives due to each different cause is shown at the foot of each column. A graph is also required by the management which shows the weekly defectives percentage by a continuous line, actual scrap by a dotted line (see Fig. 8). Foundry defectives percentage is simply the fraction: weight of defectives over castings poured, thus:

$$\frac{\text{Weight of defectives}}{\text{Weight of castings poured}} \times \frac{100}{1}$$

This figure is a rough measure of foundry efficiency, and the weight of defectives includes the weight of all castings rejected by the inspector, whether scrapped or subsequently salvaged by welding or plugging. Any "cooking" of this figure by the inspector, such as by ignoring the weight of castings successfully salvaged or by "off the record" disposal of obvious scrap, by "back-door" methods well known to all foundrymen, merely gives a false impression of the foundry's efficiency, and is the reverse of an incentive to do better work.

Two further records kept by the Author are of considerable help in avoiding scrap:—

Recurrent Faults on Individual Castings.—In foundries where batches of certain types of castings are made at irregular intervals, sometimes weeks, months, or even years apart, it is often found by the inspector that scrap is caused by the same faults, generally on the first few produced. Whenever a recurrent fault is noticed on a casting, the reason for the trouble, and any information available regarding the remedy, is entered in a book kept for that purpose only. This information is then available to the foundry foreman or any other person who requires it. In some cases it is advisable to attach this information to the pattern, core-box or job card, whichever is likely to be most effective. Of course, this record is not used every day, but it is always ready with full information if and when re-

Date, 1948.	Metal.					Moulding.						
	Misrun.	Control.	Wrong mix.	Shrinkage.	Gas or blow hole.	Loose sand.	Slag.	Gas or blow hole.	Scab.	Crush.	Offset.	Bad moulding.
Mon., 5 Jan. No.					12							
Wt.					5-0-24							
Tues. No.												
Wt.												
Wed. No.												
Wt.												
Thurs. No.												
Wt.												
Fri. No.												
Wt.												
Sat. No.												
Wt.												
Weight in lb.				1,000								
TOTAL Percentage				15·3								

NOTE.—On the original, the vertical columns are extended to the right to include space for figures under:—

Cores — "Blown," "Scab," "Broken," and "Washed."

Fettling—"Breakage," "Shape" and "Transit" Pattern Defects and Total.

Total weight of metal melted .. 30 tons 10 cwt. 0 qr. 0 lb.
Total weight of castings .. 23 tons 2 cwt. 0 qr. 0 lb.
Total weight of defective castings 1 ton 12 cwt. 3 qr. 10 lb.
Total percentage defectives .. 7·1 per cent.

FIG. 7.—WEEKLY ANALYSIS OF DEFECTIVE CASTINGS (WITH TYPICAL FIGURES INSERTED).

quired. After all, *a short pencil is better than a long memory.*

Alterations Required.—The casting inspector, if he be thorough in his methods, always keeps closely in touch with those using the castings he inspects, whether they are used in the same works or sold to outside firms. Either during foundry inspection or from observation after machining, the inspector will discover faults occasionally which must be corrected. Sometimes pattern equipment becomes damaged or distorted in some way, which is difficult to see during foundry inspection, but is revealed during machining. Porosity may be discovered after machining or hydraulic test, which can be corrected by a riser, alteration to a runner, or use of a higher-grade metal. These and many other faults can, and do, occur, and it is the inspector's business to see that those responsible for their correction are fully informed about them. Verbal complaints are often useless—they become misunderstood and sometimes ignored—while it is well known that things a person does not want to remember are most easily forgotten.

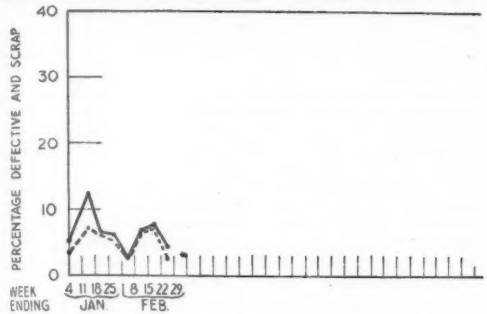

FIG. 8.—GRAPHS OF WEEKLY PERCENTAGES OF DEFECTIVE AND SCRAP CASTINGS.

When the need for an alteration is discovered, all necessary information is recorded in a book kept for that purpose only, and a carbon duplicate copy is sent to those responsible for making the alteration. Any delay will probably cause more scrap, so it is important to date the note; it is then easy to judge whether those responsible for making alterations have had reasonable time to complete them.

The form (set out in Fig. 9) used for these notes is divided into four spaces, headed "date," "description and symbol number," "recommendation" and "result." The space for "result" is filled in as soon as that information is available; in most cases the Author is happy to relate it is brief but clear—just "OK" and the date. The space headed "recommendation" contains all information collected by the inspector regarding the fault in the castings, and often a suggestion as to the method of rectification, which appears most suitable to the inspector.

This system of keeping down scrap has been in operation for several years and, thanks to the co-operation of the foundry staff, has proved most successful. Occasional friction between the foundry staff and the inspector is apparently one of the basic laws of nature, but in the foundry where the Author is casting inspector, this is regarded as a form of safety valve, though it is not allowed to affect the foundry efficiency in any way. The inspector's suggestions regarding methods of rectification are not really popular. If he be right, the only form of thanks he is likely to get is a "dirty look," but if his suggestion be based on mistaken ideas, it is often in certain quarters the cause of visible and audible pleasure.

Foundry Meetings

The basic object of the weekly foundry meeting is to promote full co-operation between the different sections of the foundry, to the mutual benefit of all. The meeting is under the chairmanship of the works manager, and is attended by the foundry superintendent and as many of his staff as are required, plus the inspector. No discussion as to "faults to be corrected" should ever be carried on in the absence of those responsible for their occurrence and cure. The inspector presents his figures for the previous week's defectives, *etc.*, and reports any castings which have given trouble during that time. In the discussion which follows, the cause of defects is usually found, and method of rectification decided upon. If an abnormally high percentage of the week's scrap is due to one or two causes, such as bad moulding, metal faults, offset, *etc.*, this will be clearly shown on the "weekly inspection sheet" (Fig. 7) and the reasons for this will be promptly inquired into.

This type of meeting is a very effective scrap preventive; naturally, no person on the foundry staff likes to be called upon too often to discuss troubles for which he is responsible. Also, a full discussion of all foundry troubles under the chairman's direction is a most effective preventive of that most prolific scrap producer known as "passing the buck." Consistently good results from this meeting in the past make it very unlikely that the practice will be discontinued in the future. Efficient "primary inspection" of patterns, sands, cores, in fact all materials, used in conjunction with efficient casting inspection, co-related, guided and controlled by the foundry meeting, will do much to make a foundry first class.

Contacts with Customers

Whether the customer using the foundry's products be an outside firm or whether machine shops connected with the firm which owns the foundry are the recipients, it is essential that the casting inspector keep closely in contact with them. Actual contact is naturally the most likely method of getting good results, but contact by correspondence is much better than none. In the case of customers who can only be reached by letter, the inspector will be well advised, when he despatches the first castings, to ask for a report, after machining, on their quality. Not only will this be appreciated by the customer, but sometimes small amounts of scrap will be reported earlier than normally, and the fault can be corrected by the foundry in time to prevent a large amount of returns, due to casting faults, at the end of the contract.

Casting Inspection

If the machine shop be part of the same works, the management should insist that all casting faults be reported to casting inspection immediately, and all rejected castings returned to the foundry for examination by the foundry foreman, inspector, metallurgist, or anyone else concerned. This rule, which leaves no doubt as to the *amount* of scrap after machining, also leaves no doubt as to reasons *why* the castings were scrapped it also checks any tendency towards "funny business" by the machine shop.

It is essential that the inspector views the faults in castings, whether cause of scrap or not, which show up after machining, and if he be at all doubtful about the cause of them, he should ask the advice of the foundry foreman or metallurgist before attempting to get the fault rectified. The foundry should never be guided by reports from machine shop or customer regarding the nature of casting faults. The average machine-shop man has only a vague knowledge of foundry problems, and usually refers to all casting faults rather vaguely as "blow-holes" or "porosity," or even more vaguely as "dirty." The doctor must *see* the patient and diagnose the trouble correctly before prescribing the cure. At times the inspector may be called to the machine shop to view a "casting fault" which proves to be a "false alarm," or he may be shown an apparent dimensional casting fault which he can prove, after checking, to be an error on the part of the machine shop. In such cases, the inspector will be well advised to avoid making any nasty remarks, or even enjoying a hearty laugh; real friendliness and co-operation between customer and inspector is of great help to both, and if the inspector sends some "border-line cases" to the machine shop occasionally, a spirit of helpful friendliness in that department may mean the difference between scrapping and using the castings.

When castings produced in the foundry are machined in the same works, the manager may sometimes give instructions that some valuable, but defective, castings must be rectified by the machine shop, often at considerable trouble and expense. This is usually good economics, in the interest of the firm as a whole and, as it keeps down foundry scrap, it always receives the whole-hearted approval of the foundry. Unfortunately, from the inspection point of view, the effect is not entirely good, and unless the manager "stirs up an effluvia" at the time, capable of hanging around for weeks, there is danger of the encouragement of "sloppiness" in the foundry. The reception of such castings in the machine shop is never the occasion of much rejoicing and, if such things happen frequently, relations between machine shop and foundry are likely to become strained.

Salvage of Defective Castings

Before deciding that a defective casting shall be salvaged, the inspector must be sure the answer to the following questions is "yes":—(1) Will it be as good as normal production in every way? (2) will it satisfy the customer? (3) will there be risk of fracture during, or after, salvage? and (4) is the casting worth the cost of salvage?

The foundry will usually agree with the inspector that a casting which has been broken in three pieces cannot be welded, if one piece is lost! In all other cases less serious than this the foundry is generally of the opinion that they can be, and should be, salvaged. Naturally, the foundry will bring all possible pressure to bear on the inspector in favour of salvaging castings, but if he be weak enough to be influenced, he will soon find he cannot answer one, or perhaps more than one, of the above questions in the affirmative. Remember, an obviously patched pair of trousers may be wearable, but they will not satisfy a customer who has ordered new ones.

The inspector must know enough about available salvage methods to form his own opinion, make his decision, and adhere to it; he represents the customer in his absence. If the inspector decides to rectify a casting, he must choose the form of rectification to be used, get it done, and examine the casting thoroughly afterwards, especially in the region of the repair; a repair job is just as likely to be defective as a casting, and inspectors should avoid taking anything for granted. Many specialised or patented repair methods are good, but as these are rarely available in the average foundry, the inspector need only consider the merits of those which are common in most works; these are:—Welds (acetylene and electric), burn-on, plugs, iron cement and, sometimes after machining, Bakelite (varnish), rusting (sal ammoniac) and, possibly, insertion of liners.

(To be continued)

Rectifications Required.

Date.	Description.	Recommendation.	Result.
Feb. 19, 1948	NS. 48/3 Valve Chest	At least 20 per cent. leak on hydraulic test, after machining. Leakage due to porosity in central section through boss, revealed after drilling. Riser probably required on this boss.	23/2/48 (Riser added, 21/2/48.) Sample casting cut in Foundry Insp. Dpt. No porosity. 27/3/48 Batch of 50 machined and tested, O.K.

FIG. 9.—INSPECTION DEPARTMENT RECOMMENDATION SHEET.

A Visit to a Modern Moulding Machine Works

A great change has come over the foundry equipment industry. About 20 years ago, the imports of moulding machinery and the like must have been of the order of £250,000 per annum, whilst to-day the industry is exporting £600,000 worth each year. This growth has been shared amongst the 20 to 30 firms comprising the industry. It is the intention of the writer to re-visit the works of firms which are making such a worthwhile contribution to British exports. One such visit has already been made to the works of the British Moulding Machine Company at Faversham in Kent. The reason for the choice of site was more or less accidental. The Bermondsey works were destroyed by enemy action during the war, and an arrangement was made with a Faversham shipbuilder to have the use of a large shop. The next step was the creation of a new factory specially designed for the production of moulding machines. A aerial view of the works and offices is shown in Fig. 1.

The offices are noteworthy as being an outstanding example of all that is best in modern construction. The attention given to the heating, lighting and ventilation installations has produced ideal working conditions. On entering, there is a spacious reception hall, with a central corridor, roof glazed, running right and left along the length of the building. The upper part of the centre section of the building is given over to the design and drawing offices, each of the many rooms in the building is fluorescently lit, centrally heated, and fitted with an electric clock and internal communication speaker, all corners are rounded to facilitate cleaning. The office of the sales manager, Mr. H. J. Bullock, who was the writer's chaperon, is specially laid-out for the purpose of promoting sales. There is, for instance, before the window an automatically-controlled cinema screen which, when lowered, puts the office in total darkness. On the opposite side is a built-in 16-mm. projector. Believing in the appeal of the visual means as a factor in education, collections of films and slides have been made available for scholastic needs.

At the other end of the building are rooms containing the "punched card" machines for conducting the commercial and control sides of the business. Complete mechanisation has resulted in the ability to take stock in a four-hour period just when this may be required. It is interesting to note that all these recording machines are British made, and the system ensures accuracy, for when a series of cards is punched to fulfil a certain purpose, they are put through a testing machine, which automatically rejects any incorrectly perforated. Adjacent to these rooms are well-equipped tracing, printing and photographic departments where drawings are mounted and glazed for use in the works.

The good order prevailing in the offices extends to the works, where each workman is equipped with a white boiler suit; not fewer than eight labourers are constantly employed on sweeping paths and generally cleaning up, and each labourer has his own lock-up cupboard in which to keep his brooms, buckets and other tools of his trade. The machine tools are all modern and entirely of British manufacture. Amongst them was noted a honing machine for imparting a "glass smooth" finish to all bores with the object of reducing wear on packings, etc. The service pipes are all suitably coloured according to the nature of their duties. The stores are particularly orderly and the punched-card system enables such rigid control to be maintained that storekeepers, in the normal sense of the word, are not necessary. There is a compact combined canteen and messroom for providing light refreshments, for, in a small township it is easy for the staff to return home

FIG. 1.—AERIAL VIEW OF THE WORKS OF BRITISH MOULDING MACHINE COMPANY AT FAVERSHAM.

Moulding Machine Works

or use the local catering facilities for main meals. The staff is exceptionally youthful, and whilst no organised apprenticeship is in being, the work cards issued are so clear, and jigs, templates and fixtures so well designed, that rapid progress is made and a high standard of production achieved. The general appearance of the main erecting shop is shown in Fig. 2; the writer noticed in this department two large core-stripping machines for Poland; other machines were destined for India, France and other parts of the world.

Foundrymen who happen to be spending holidays in one of the many seaside towns in this delightful corner of Kent will receive, as did the writer, a warm welcome, and be shown an organisation which has many worth-while lessons to teach in the conduct of a modern and progressive business.

FIG. 2.—MAIN ERECTING SHOP FOR MOULDING MACHINES.

New Catalogues

Strippable Coatings for Castings. A six-page folder received from Croda, Limited, Snaith, Goole, Yorkshire, describes a process for prevention of the rusting of castings and the like by dipping them in a plastic material carrying the trade name of either "Crocell" or Lowerite." A really thick coating can be given so that a component can, during transport, resist damage through contact with extraneous objects. For removal the skin is split open and peeled off. The difference between the two materials is that one is applied hot and the other cold. The folder is neatly carried out in red, blue and brown, and carries some interesting technical data.

Industrial Ovens. From Stordy Engineering, Limited, of Midland Chambers, Princess Street, Wolverhampton, we have received a 16-page brochure covering the question of drying plant for several industries. Amongst plants listed and described are mould-drying stoves and core ovens, drying ovens for vitreous enamelling and for paint work. Excellent use has been made of photography and colour printing. In the main, the brochure tells its story by the use of clearly annotated pictures, though line drawings are included of re-circulatory drying plant for foundries. The catalogue is available to our readers on writing to the issuing house at Wolverhampton.

Corrugated Aluminium Sheets. The British Aluminium Company, Limited, Salisbury House, London Wall, London, E.C.2, have sent us an exceptionally well-produced catalogue dealing with "Rigidal" corrugated aluminium sheet. The covers carry impressive pictures of factory roofs, but one is still left with the notion that page 3 should have been used as the front cover, for it is an attractive, nicely balanced design. The technical data included are well presented and easily assimilated. The illustrations are good examples of the art of photography for use in trade literature. The brochure is available to our readers on writing to Salisbury House.

Core Powder. For the description of a new core-bonding material, which Mr. Harbach referred to in a recent technical discussion as being used at the Coneygre Foundry, the Fordath Engineering Company, Limited, Hamblet Works, Albion Road, West Bromwich, have used one of their standardised instruction leaflets. It is numbered "eight," and treats of this new material which is called "Airbond," because, except for the really bulky cores, air drying suffices. An important feature claimed for this new material is that no fumes were evolved on casting. The technical data have been well chosen and are clearly set out. The only criticism we have to make is on page 3, where the type used for the words "Compression" and "Tensile" is too large. The pamphlet is available to our readers on writing to Hamblet Works.

Some Reflections on the Investment Casting Process*

By D. F. B. Tedds

(*Continued from page* 282)

Water Solutions

These can be made using either ethyl silicate or a hydrous silica sol. Hydrous silica sols which are produced from sodium silicate may contain from 3 to 18 per cent. silica and will produce moulds equal in strength and character to those produced with a spirit solution. Certain small deviations are required from the standard procedure when using these materials, but the results are quite satisfactory.

The main advantages of using a water solution are:—(1) It is relatively cheap, and (2) eliminates the necessity of fire-proofing and elaborate ventilation of moulding room.

The main disadvantages are:—(1) Facilities must be made for water-proofing the primary coating prior to investing, and (2) the time required for the initial drying stage must be considerably lengthened.

Vibrating

Vibrating of the moulds may be used alone, or combined with a vacuum treatment. Vacuum treatment applied to the moulds during the vibration period has certain attractive features, but can also produce its own particular problems. It has not been found essential that the two (vibrating and vacuum treatment) should be practised together and, as vibration can be conducted so much more easily and cheaply, this is to be recommended.

Vibration as applied to an investment mould has several control factors, chief among them being direction, amplitude, frequency and time.

Direction.—The principal direction of the vibrating motion is vertical (up and down) which gives a "tamping" action.

Amplitude.—This means the distance which the material travels in one cycle of the vibrator. It is recommended that a low amplitude in the order of 0.010 to 0.020 in. should be used. Higher amplitudes tend to shake the patterns off the wax assembly, have a greater separating action on the investment, introduce air into the investment and, in extreme cases, fracture the primary coating.

Frequency.—This is measured in cycles per second. The frequency used varies with the type of vibrating machine. For mechanically operated vibrators, a frequency between 1 to 10 cycles per sec. is more usual, but pneumatic and electrical vibrators may vary between 30 and 60 cycles per sec. The higher frequencies are recommended when used in conjunction with a low amplitude.

Time.—The period over which the vibrating is continued varies with the vibrating conditions and the grain size of the investment material. A usual time is between 30 min. and 2 hrs. It is often suggested that the investment material should be subjected to vacuum immediately before pouring it into the mould, and also whilst the mould is vibrating, in order to eliminate air. In the Author's view, these operations are not necessary, since the majority of the air is removed in the early stages of vibrating. Should the vibrating operation be eliminated, then vacuum treatments would be beneficial.

Whilst the elimination of vibrating has attractive advantages, *e.g.*:—(*a*) It eliminates an operation in the procedure, thus reducing the production time, and (*b*) it saves capital expenditure.

These are far outweighed in the technical advantages achieved when vibrating is applied, *e.g.*:—(*a*) It eliminates air from the mould; (*b*) consolidates the refractory material around the wax pattern, produces better mechanical adhesion between the main body of the mould and the primary coating; and (*c*) it expels excess bonding solution, thus minimising mould cracking.

Metal Melting

Metal melting for the investment casting process is invariably carried out in electric furnaces of induction or arc type. Other methods of heating are impractical and uneconomical. The most important factors to consider when choosing which method to apply are:—

(1) *Melting Time.*—This must be highly controllable, since varying alloys have varying melting and casting temperatures, and care must be taken not to prolong the melting time, causing the ingoing metal to oxidise, or melt too rapidly, probably causing burning.

(2) *Metallurgical Factors.*—Care must be taken in melting not to alter the composition of the alloy being melted.

(3) *Temperature Control.*—Close control of molten metal temperatures must be exercised rigorously. This is necessary because the melts are so much smaller than those normally dealt with, and once the metal is molten the temperature rises rapidly. The best types of immersion thermocouples are the most satisfactory ones in operation, for exercising this control.

Induction Melting

It is usual to employ the coreless induction type of melting furnace of approximately 20 lb. capacity, using a spark gap converter. These are reasonably cheap to operate and offer excellent facilities for deoxidation to be carried out, should it be desired. Care must be taken during melting to avoid oxidation of the alloying elements in the steel, especially if chromium, tungsten, titanium, vanadium. molybdenum, and the like, be present. Certain precautions can be taken, *e.g.*,

* A Paper read at Exeter before the Bristol and West of England Branch of the Institute of British Foundrymen.

Investment Casting Process

slag-making materials such as silica sand and glass in the case of acid linings and lime and a little fluorspar in the case of basic linings can be added with the charge so that when the first metal melts it will be covered with slag. Alternatively, a soft gas flame may be burned over the mouth of the crucible to assist in maintaining a reducing atmosphere.

When melting, it is advisable completely to fill the crucible. This facilitates rapid melting, minimises the chilling effect of the crucible on the stream of molten metal when pouring, and also minimises the possibility of the crucible fracturing, due to thermal shock. The melting times from this type of induction furnace are fairly rapid, being 20 min. between each cast, once the first charge has been melted.

The advantages of this type of furnace are:—(1) It facilitates the adoption of normal steel melting practices; (2) little or no carbon pick-up is encountered; and (3) stirring action of molten metal gives homogeneous cast.

The main disadvantages are:—(1) The preferential oxidation of special alloying elements requires careful control during melting and (2) it cannot be used successfully for direct pressure casting, but can be used in conjunction with centrifuging machine.

Indirect Arc Melting

The best-known furnace of this type is the Detroit rocking arc, and it is upon this design that the majority of melting furnaces for investment casting have been developed. The main addition has been the fitting of air pipes leading into the crucible of the furnace which, on casting, allows air to flow at a pre-determined pressure and so forces the metal into the mould. The furnace is powered through a transformer fitted with a variable reactance which gives some measure of control over the speed of melting and furnace operation. The furnace can be rocked, thus ensuring an even distribution of alloying elements and also temperature, and compensating for the absence of electrodynamic forces which prevail in the induction furnace. The furnace atmosphere is neutral or slightly reducing, thus giving the minimum of preferential oxidation of alloying elements, whilst the speed of melting is quite rapid, 5 lb. of metal being charged and cast in 10 to 15 min., from a hot furnace.

The advantages of this type of furnace are:—(1) Very low operational cost; (2) adaptable to direct pressure or gravity casting; and (3) capital cost is of moderate order.

The main disadvantages are:—(1) There is a certain amount of carbon pick-up which is detrimental in low-carbon alloy steels; (2) small sized melting stock only can be charged owing to small aperture (1 in. dia.) leading into the crucible; (3) little or no refining can take place on the bath of molten metal prior to pouring; and (4) some loss of alloy contents is encountered and must be allowed for.

CASTING

Probably the most important point which has been brought to finality in investment casting is that some form of pressure must be imparted to the metal when introducing it into the mould, especially when attempting to cast components of very thin section (0.010 to 0.040 in.) and considerable surface area; also, another important factor is that the casting operation needs precision tools in order to carry it through successfully. The main methods of applying pressure consist of vacuum, centrifugal and direct air, there being numerous combinations of these which may be the subject of experiment. For practical discussion, only the ones in everyday use will be considered, *i.e.* (*a*) axial centrifugal methods, and (*b*) applied air pressure.

Centrifugal Casting

The two main types of machine used are (*a*) the double-arm axis machine where rotation of the moulds is in a horizontal plane, and (*b*) the vertical machine where a mould rotates about its own axis in a vertical position. The double-arm machine consists of a metal base which rotates about a central shaft, being motor driven with suitable speed control. Moulds are attached to each arm in a horizontal position, and metal is poured into the central pouring pit where it is forced through the arms and so into the moulds.

The vertical machine consists of a revolving turntable operated by a variable speed motor. The moulds are securely clamped to the turntable, with the mouth of the runner cup uppermost. It is advantageous with this type of machine to attach the wax patterns to the central runner tangential to the flow of metal. This eliminates the stream of metal having to change its direction of flow abruptly, and thus minimises turbulence and fills the mould cavity rapidly.

Important points to be observed when using centrifugal casting methods are that the moulds must be encased in a metal shroud, thus imparting extra support and strength to the mould. Vibration of the machine must be at an absolute minimum, for apart from metallurgical considerations, there is danger of rupturing the mould. The speed of rotation is also important in this respect, and it is not advisable for speeds in excess of 500 r.p.m. to be attempted. This is sufficient to fill the mould quickly and impart adequate pressure to the metal.

Using these lower speeds, it is common practice to set the machine in motion, so that it may pick up speed and the metal is introduced when the mould has attained maximum rotation. A further practical point which must be mentioned is the question of temperature control of the metal entering the mould. This cannot be so easily controlled since the metal is subject to several temperature drops:—(1) As the metal is transferred from the melting furnace to the ladle, and (2) a second drop occurs when the metal is poured from the ladle into the mould.

The advantages of this method of casting are:—(1) It is highly adaptable, since the metal entering the cavities may be introduced at varying pressures and

velocities, controlled by the speed of rotation; (2) it is ideal as part of a production unit, involving a minimum of capital expenditure, and (3) maintenance costs are low.

The disadvantages are:—(1) Metal shrouds are required to support moulds during casting, and (2) control over temperature of metal entering the mould is difficult.

Direct Air Pressure Casting

This is often termed low-pressure casting since generally air pressures of 5 to 15 lb. per sq. in. are applied to the molten metal. Pressures below 5 lb. are inadequate to force the metal at a sufficiently high velocity so as to fill completely the mould cavity. Pressures over 15 lb. per sq. in. tend to rupture the mould unless extra support is available in the form of a metal shroud. The direct air pressure can be introduced quite readily to the molten metal when casting from an indirect arc furnace, a cam being attached to one of the uprights forming the mould clamp. Upon inverting the furnace, this depresses an air valve thus allowing the air to flow and so force the metal into the mould. The pressure on the sprue tip tends to force the metal downwards as it freezes, but this is often nullified over the rest of the casting, the thin sections having chilled off very rapidly.

An important factor is to ensure that a good tight seal is made between the mould and the furnace top plate and also around the carbons. Should leakage occur at either of these positions, then mis-run castings will almost certainly ensue, due to lack of initial velocity being applied to the molten metal. The advantages of this type of applied pressure are:—(1) It is relatively safe and easy to apply, and (2) not critical in application if kept within suitable limits, *e.g.*, 5 to 15 lb. per sq. in.

The main disadvantages are:—(1) A number of small melting and casting units are required if quantity production be envisaged, since each cast completely empties the melting furnace, and (2) failure of pressure seals or operation of the cam produces misrun castings.

Conclusions

It is obvious from the foregoing that decisions related to the investment casting process must be carefully weighed before they can be finally established. The alternatives at each stage of the process must be taken upon their merits and related to the type of castings produced. Summarising the various points, the following facts arise:—

(1) Soft metal dies are ideal for development work, but for quantity production and the highest degree of accuracy, machined dies are desirable.

(2) Wax is still the most adaptable material for producing the expendable patterns, but it must be used in a temperature-controlled room.

(3) High-pressure injection is necessary on a number of components, but this must be coupled with close temperature control of the pattern material and controlled speed of injection.

(4) A primary coating is necessary for superior surface finish, and although dip coatings can give very good results, a sprayed coating is to be desired as it can be applied more evenly with no chance of occluded air bubbles.

(5) The employment of a coarse or fine textured investment depends largely upon the component being cast and the method of casting. For pressure casting, which is necessary on the majority of components, then a medium or fine texture refractory is desirable.

(6) From the economics point of view, a water-bonded solution must be used, being cheaper to compound and involving less capital expenditure initially on such items as elaborate ventilation and fire-fighting equipment.

(7) Vibrating is necessary to consolidate the refractory material around the wax pattern and remove occluded air from the mould. The vibrating conditions should aim at low amplitude and high frequency and a pneumatic vibrator is favoured for this, owing to its low running and maintenance costs.

(8) The type of melting furnace used is related to the method of casting adopted. The induction melting furnace used in conjunction with a centrifugal casting machine offers the closest metallurgical control over composition of the metal and is an excellent production unit. The indirect-arc melting furnace adapted for direct air pressure casting is ideal as a jobbing unit for various sized moulds.

House Organs

The S. & W. Magazine for March. Published by Smith & Wellstood, Limited, Bonnybridge, Scotland.

This issue records the death of Mr. A. Lapsey, foreman patternmaker, who had served the firm for more than 50 years. He was 63 years old. A note on the career of Mr. John Izatt, who, as a moulder and timekeeper, has been with the company for 62 years is also included.

Industrial Wales (March issue). The Journal of the Industrial Association of Wales and Monmouthshire, published from Aberdare House, Mount Stuart Square, Cardiff.

A detailed account is given of the visit of Sir Basil Brooke, Prime Minister of Northern Ireland, to both North and South Wales. The cover shows a couple of fettlers busily engaged on a large cylinder casting made by the Tubal Cain Foundry, Cardiff.

The Nickel Bulletin, January to February. This issue departs somewhat from its normal appearance by the introduction of colour in the cover, for the first time since before the war. It carries some 35 pages of abstracts, of which a large proportion are devoted to heat- and corrosion-resisting alloys, electrodeposition and other coating methods and electropolishing and stainless steel. An unusual application of nickel-chromium steel in bone fixation in orthopædic surgery is featured, together with some interesting data on the formation of stainless-steel milk pails.

Fatigue of Cast Crankshafts

In a paper which Dr. H. R. Mills and Mr. R. J. Love are to present to the Institution of Mechanical Engineers on fatigue strength of cast crankshafts, on April 12, the following conclusions have been drawn:—

(1) The nominal limiting bending stresses for the cast crankshafts are, very approximately, one-third of the limiting stress of the material determined on unnotched rotating-beam specimens cut from separately cast bars, or about one-sixth of the tensile strength of the material. These values are very similar to those obtained for forged steel crankshafts.

(2) The bending fatigue strength of the cast-iron crankshaft is unaffected by surface finish changes.

(3) The bending fatigue strength of the cast-iron crankshaft is influenced considerably by fillet radius. A change of fillet radius from 0.031 to 0.125 of the crankpin diameter produced an 85 per cent. increase of strength. Fillets undercut into the web face caused a considerable reduction of strength.

(4) Increase of crankweb thickness or breadth gives an increase of crankshaft bending fatigue strength, but the improvement is not as great as the resulting increase of crankweb section modulus. Above certain values a greater web thickness or breadth gives only a very small increase of strength.

(5) Crankpin length does not influence bending fatigue strength.

(6) The introduction of lightening holes, below a certain size, results in an increase of bending fatigue strength, the optimum hole size being about 0.4 of the crankpin diameter for the crankshafts tested. A larger hole can also be used with very good results if it is made eccentric with the crankpin axis.

(7) An increase of journal overlap produces an increase of fatigue strength; but above a certain crankthrow, an increase of crankthrow, or increase of "negative overlap," also produces an increase of fatigue strength. With the present hollow shafts, a minimum crankshaft strength was obtained at an overlap of −0.15 of the crankpin diameter.

(8) The nominal limiting stress for the crankshaft is influenced considerably by the crankshaft size. Reducing all the linear dimensions of the crankshaft by one-half resulted in a 28 per cent. increase of nominal limiting fatigue stress.

(9) The variation of results obtained for a batch of castings of the same design demands that caution be exercised when comparing the estimated strength of different designs. To obtain a more reliable value for the fatigue strength of a particular design it would be necessary to test considerably more than five specimens of that design.

(10) Tensile and fatigue specimens machined from separately cast test bars do not necessarily give similar values to specimens machined from the crankshaft castings. From the small amount of data available, tests on specimens machined from separately cast bars do not appear to be closely representative of the fatigue properties of the crankshafts. At the same time, tests on the specimens machined from the crank-

(*Concluded at the foot at column* 2.)

shaft castings are probably not representative of the fatigue properties of the crankshafts either, since these fatigue properties are dependent on the properties of the material near the surface.

(11) It is considered that conclusions 4 to 7 are equally applicable to forged steel crankshafts.

Book Review

Reminders for Company Secretaries. (10th Edition.) By J. Gordon Hassell. Published by Jordan & Sons, Limited, Chancery Lane, London, W.C.2. Price 6s. net.

The lot of the Company Secretary is to-day indeed an unhappy one. Apart from dealing with all the normal secretarial matters which require common sense and a technical grasp of the company's business, he is expected to have an encyclopædic knowledge of the Companies Act, 1948, a working knowledge of the Income Tax and Finance Acts, an up-to-date knowledge of the Board of Trade Regulations, some knowledge of the Factory Acts and a rough idea of the various Bills looming up on the Parliamentary horizon. The Companies Act alone contains more provisions than anyone could possibly remember and the wording of some of its clauses would defy the Oracle of Delphi and many leading counsel. Appendix II of this book, which runs to a dozen pages of close print, lists the offences and penalties pertaining to the Companies Act alone. Half of these offences are the liability of every officer of the company and it is usually the secretary's task to see that no officer becomes liable.

This book is arranged under convenient headings in alphabetical order and within the compass of only one hundred pages it gives the answer in general terms to all the Companies Act, questions with which the secretary will be bombarded daily The information is so clearly arranged that a general answer to all the common questions could be given in the course of one telephone conversation and with this book at his elbow the secretary should be able to put a good façade of omniscience.

It is unfortunate that the Stock Exchange Regulations were not dealt with in the same book, as for any company whose shares are quoted, compliance with Stock Exchange Regulations is almost of equal importance with compliance to Statutory Regulations. Once this limitation is grasped, however, the book will not lead the secretary astray. It is proable that the book will be mainly used by the secretaries of private and exempt private companies, and it is perhaps to be regretted that space could not be found to devote a chapter to the qualifications for "Exemption." The provisions which secure exemption are reproduced from the Act and a little elucidation in simple English would have assisted the ordinary man in unravelling the meaning of this statutory wording. Bearing in mind that the book is limited to a hundred pages, the selections which have been reproduced verbatim from the Act are well chosen and the explanatory matter is clear and well compressed. This book can be recommended to the secretary of every company as a means of answering each question broadly.

G. B. J.

Core Carriers

By W. A. White

The importance of core carriers and the part they play in the modern mass-production foundry is often overlooked and very little has been written about this essential part of high-speed core making. Any competent core-shop foreman is well aware of the importance of particular cores, the type of sand, its composition, the technique concerning the various bonds, and the percentage of scrap; but seldom can he ascribe correctly the scrap losses to a given reason, quite often the trouble is blamed on the carrier equipment, and for this reason alone carriers should receive closer study.

Core-carrier sections are sometimes referred to as "baking-tin" sections, and the description fits only as far as the application of the job they are required to do is concerned. Seldom is tin used in the making of core carriers, so "baking pans" might be a better appellation, for that is what carriers really are. Many factors must be considered when making core carriers and these can be grouped under several headings. They include: type of material used in carrier construction; number required; oven temperature; design; speed of manufacture, and costs. All the groups are interdependent, as can be seen from a close study of the list.

Choice of Material

The type of material used in the construction of carriers is dependent on the temperature used for baking the cores. The maintenance question is closely related to the type of machine used, for where large numbers of carriers are required for cores containing a high percentage of linseed oil in the sand, the cleaning of these carriers is rendered different if they be of aluminium. If, however, they are made of cast iron, a caustic solution of soda and a tank of hot water solves the problem speedily and cheaply. There is much to be said for cast-iron in the manufacture of carriers—ease of manufacture; simplicity in cleaning; low overhead cost; speed of replacement: although against these must be placed a high breakage rate if they are handled carelessly. Where weight is a factor to be considered, it is an advantage to use aluminium, especially where cores have a plane surface and can be turned out on a plate-type carrier. The cleaning of plates does not require the same treatment as the more intricate contoured carrier. Care must be taken, where two types of metal are used (such as cast-iron for pipe cores and aluminium for plated jobs), to ensure that the aluminium plates are not subjected to the same cleaning process as the cast iron. Aluminium and caustic soda are not compatible and mixing the two will not reduce costs.

Design

The design of a carrier must, of course, follow the inside contour of the top half of the core box, consultation with the core shop personnel is important if the maximum efficiency is to be obtained. For instance, the designing of carriers with sharply protruding ribs which are difficult to slide over oven bars is bad practice. Failure to envisage the width of an oven when considering sizes of plates may result in the use of two plates side by side and leave some waste space; earlier attention might disclose the possibility of using three plates on a shelf. All these points make for an efficient handling of the job.

Fitting Tolerances

The time spent in fitting carriers to the master jig or dummy can be largely saved if, where large numbers made from a metal pattern on a moulding machine are required, the patterns are worked to the closest possible limits; even where the patternshop inspector passes the carrier pattern for production, he should not do this until at least one trial casting has been made. Where machining facilities are available, carriers should be designed to be machined wherever it be possible. The use of multi-gang cutters for pin cores is a good example. In short, the same care and attention that is paid to master-jigs, dummies and production patterns, should likewise be given to the carrier pattern, and the core-shop management should see this is carried out; because all time and material charged to core carriers is a direct charge to core-shop costs—or should be. The system used in many plants is that all jigs, fixtures and patterns for the making, checking and fitting of carriers are made in the metal-patterns section, and are inspected by the shop inspector, and then passed over to the carrier section, which should then take sole responsibility for drawing the pattern jigs, the ordering of supplies for the core shop, and the supply and maintenance of carriers until the job is obsolete.

Layout

The system of having the carrier section as part of the patternshop has many advantages. It enables the superintendent of patternshop to keep a close check on core equipment which comes under his control and amongst other things allows the patternshop, through the carrier section, to keep a close control on core faults that might otherwise be blamed on core-box troubles.

The fitting of carriers to a master-jig and making them available for core-shop use can be carried out by semi-skilled labour; although the actual making of jigs and fixtures should be allotted to trained personnel. Therefore the ideal carrier section should contain, in addition to the supervisor, at least one skilled man able to carry out any small repairs or alterations to equipment, when required and according to the volume of work required by the section.

A Self-contained Department

A competent carrier section should have the responsibility of all work in connection with this line; and after the initial design is approved should be able to carry out all duties necessary to the job. Firms who train their own skilled men will find they have a pool of good fitters and tool makers in the keen young personnel of the carrier section, in fact, some plants make it a rule that a certain period must be spent in the carrier section as part of training for the formation of the skilled operators of the future.

Core Carriers

The system used for fitting carriers to the master-jig or "bedding down" must be adapted to local conditions. Where compressed air is available, a small portable air grinder can be used, and one taking stones up to 2-in. diam. has been found very useful. The type of grindstone or wheel must, of course, vary with the type of work being carried out; but for all practical purposes, the stone 1½ in. × ¼ in. with a ¼ in. dia. Whitworth thread in the centre is one of the best types for carrier work, for it allows the operator to reach the corners of castings.

The fitting of carriers should present no problems, as the usual rules of the craft apply, and so long as the section is equipped with modern tools and the supervision is adequate, the main job of the carrier section is to keep the core-shop personnel happy. The only way to keep them happy is to give them all they ask for, at least two days before they ask!

Foundry Reunion Dinner

In honour of Mr. Robert Taylor, founder of the firm of Robert Taylor & Company, (Ironfounders), Limited, Muirhall, Larbert, and to celebrate 29 years of unbroken activity, a dinner and dance took place in Falkirk recently, with a company of nearly 300 in attendance. Mr. Andrew Porteous presided at dinner and proposed the toast of "The Firm," to which Mr. Taylor replied. On behalf of the employees and staff, Mr. John Somerville asked Mr. Taylor to accept a silver cigarette case, and Mrs. Taylor a bouquet. Mr. Ronald Taylor, on behalf of the family, presented Mr. and Mrs. Taylor with a silver tea service, and after the guest of honour had made appropriate reply, he presented each of 11 employees who had completed 25 years' service with a monetary gift.

THE BISHOP OF LICHFIELD—Dr. E. S. Woods—last week attended a meeting of the Joint Production Committee organised within the works of John Harper & Company, Limited, Willenhall. In a statement made later to the Press, the Bishop expressed his belief that "the human approach to common problems was a very fine thing."

large number of back-axle casings for some of the best-known motor cars in the country. A good deal of time was spent in the section devoted to the smaller range of castings, particularly those of a repetitive class. This factory is fully mechanised and its layout was much admired, from the sand mill to the assembly benches and the coring and handling of the boxes prior to their being transferred to the runways. The machine shop is equipped with the most modern machines, and the firm are to be complimented on possessing a works in which the foundries are a model of what they should be. The visitors on leaving were full of praise for what they had seen, though at the same time they were pondering over the question of the meagre number of youths desiring to become moulders.

Notes from the Branches

London—East Anglian Section

The Section met at the Lecture Hall, Central Library, Ipswich on March 10, to hear a practical Paper on Steel Castings, written by Mr. W. L. Hardy, of Lake and Elliot, Limited. Owing to the absence of Mr. Hardy, who was in America as a member of the steel founders' productivity team, the Paper was read by Mr. S. R. Bridger.

The 25 slides illustrated very clearly the patterns, moulds and core construction. The Author emphasised the necessity for easily collapsible moulds and cores to relieve the strain on castings with comparatively thin sections of metal. It was interesting to note the running and feeding technique employed to overcome irregular contraction and yet produce a sound casting. This applied particularly on a water-jacket box for a power-house installation, which casting in the fettled condition weighed 22 cwt. An informal discussion took place after each slide and many interesting points were raised. Mr. Hardy acknowledged his appreciation of the assistance of Miss Markham in producing these excellent slides.

Concluding the meeting, a vote of thanks was proposed by Mr. D. Carrick, who commented on the excellent way Mr. Bridger had presented the Paper and paid tribute to the Author's ingenuity in constructing heavy steel moulds. Mr. Carrick also remarked that the technique employed in steel foundries is very different from that in grey-iron foundries—much heavier feeders being necessary and the use of chills and denseners being more extensive.

Newcastle-upon-Tyne

The Newcastle Branch visited the works of Thomas Summerson & Sons, Limited, at Darlington, on March 12, and passed a very instructive morning. They were welcomed by the manager, Mr. A. F. Tosh. After dividing into parties, they were taken over the works by competent guides who showed everything connected with foundry matters. A striking impression was made upon the visitors by the extreme orderliness and cleanliness of the foundries; they were assured that this was their normal condition. Nevertheless, these ideal conditions have failed to attract apprentices to the industry, as a matter of fact there was not a single apprentice in the establishment, and a similar situation obtained in other Tees-side works.

The steel foundry is housed in a spacious building with concrete flooring and excellent lighting. The melting plant consists of two cupolas and two converters. Castings to specified analyses are produced from a few pounds up to 5 tons in weight. Amongst the equipment were noticed a Pneulec "Herrman" roll-over machine and a Wheelabrator, besides a generous supply of pneumatic tools. The extraordinarily clean finish of the castings was remarked upon, and reflected great credit on the firm's moulding technique. The larger items comprised items of railway-track components (which have long been a specialty of the company), gear wheels, valves, and a

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Iron and Steel Prices Raised

Effect of Withdrawal of Subsidies

As a direct result of the withdrawal of the subsidies on iron and steel, announced by the Minister of Supply in the House of Commons last Thursday, prices have been raised, with effect from April 1, by varying amounts. The average increase is of 9 per cent.

Foundry pig-iron prices have been increased by 10s. 3d. per ton, hematite iron by £1 14s., soft basic billets by £2 14s., and heavy steel sections by £2 12s. Details of the revised prices are shown in the list of current prices on page 32 of this issue.

As a result of the abolition of the subsidy, the steel industry will take over two principal charges from the Exchequer. The first of these is the loss attributable to abnormal freight rates. In the hope that freight rates would return to more normal levels within a reasonable time, the Government decided in 1946 to stabilise the rates charged to the iron and steel industry at 50 per cent. above pre-war and to debit any excess to Government account. In the event, the fall in freight rates was more gradual than had been expected and the decision was accordingly taken last summer to charge the industry 100 per cent. above the pre-war rates. This cost increase was carried by the steel industry pending the completion of the official price review. As a result of the latest decision, the industry will in future bear the full freight charges, which are still over 200 per cent. above pre-war.

Imported Scrap and Pig-iron Losses

The second principal charge now being taken over from the Government is the loss incurred on imported scrap and pig-iron, which arose because the foreign prices of these materials were well above the home level. In 1946 there was a negligible sum to be provided under this head, while in 1947 the booty scrap obtained from Germany was charged to the industry at the British price and no loss appeared in the accounts; in 1948, however, commercial scrap began to flow from Germany, the price going up to a high level as a result of the world shortage of scrap. Moreover, since November last, booty or other scrap acquired outside normal commercial channels has been charged at the price for scrap imported commercially.

Coincidentally with the withdrawal of the subsidies, the price structure of the industry has been reviewed, with particular reference to the rise in the industry's costs over the last 12 months, with its varying incidence on differing products. The principal result will be to allow some part of the Exchequer losses to be absorbed in the finishing trades, while improving the results on the primary products.

Besides the general price review, it has also been decided to sweep away the "loyalty" rebates, which were initiated as an incentive to consumers to place their orders with home manufacturers. Later, the system was extended to cover purchases from member firms of the trade associations. The rebates ranged from 5s. on pig-iron to 15s. on finished steel. The new price levels reflect the dropping of these rebates. A number of important readjustments of prices within each of the sections of the trade has been made. For example, in the case of sheets and tinplate, greater provision has been made than previously to reflect the reduction in costs brought about through the introduction of continuous methods of production. This has been done, not by a general lowering of the basis price —which is broadly fixed on an average over the whole trade, including both hand and continuous mills—but by making substantial allowances off the basis price for the classes of order normally handled by the strip mills.

Even at the new levels, steel prices show a considerably smaller increase, as compared with pre-war, than most other basic products. It is estimated that the latest changes may raise the iron and steel component in the Board of Trade index of wholesale prices by about 16 points to around 187 (1938 = 100). On the same basis, coal now stands at a figure of 245, while the index for all industrial materials and manufactures is around 240. British steel prices will also still compare favourably with those of any country except Australia—in so far as differences in quality and conditions allow any comparison to be made.

Levies on Producers

The Exchequer losses, now transferred to the industry, will be financed, for the present at least, largely by means of levies on producers. Thus the greater part of the loss on imported raw materials is being carried by a general levy of 26s. per ton of steel-ingot production, representing on the average approximately 36s. per ton of finished steel. In the case of steel castings, 36s. a ton is being collected at the ingot stage. Similarly for semi-finished steel, the loss is being covered by a levy of 13s. a ton on the home output of semis, whether produced for use in the producer's own works or for sale to another firm.

It is proposed to review the amounts of the levies every six months in relation to the import programme and the level of import prices, so that over a period the levy account may be self-balancing. At some later stage it may be practicable to charge the actual prices paid for imported materials to the using firms without the levy system, but, in view of the abnormal level at which import prices now stand, it is considered that such a course would not, in the meantime, be practicable.

Arthur Lee & Sons, Limited

The directors of Arthur Lee & Sons, Limited, announce that in consequence of a Government amendment passed on March 17, the name of Arthur Lee & Sons (Hot Rolling Mills), Limited, appears in the reprint of the Steel Bill instead of that of the parent company as in the original draft. The effect of this and of negotiations with the Ministry of Supply will be, if the Bill becomes operative, that the hot- and cold-rolling interests will go over to the Iron and Steel Corporation on the vesting date, but that the remainder of the interests of Arthur Lee & Sons, Limited, will be free from the operation of the Bill and will remain in the parent company.

News in Brief

F. & M. SUPPLIES, LIMITED, Poplar, London, E.14, is exhibiting foundry supplies at the Canadian Trade Fair which is to be held in Toronto from May 30 to June 10.

HAND CHARGING at the furnaces of the Fullwood Foundry Company, Limited, Mossend, Scotland, is soon to become obsolete, as a mechanical charger is being installed.

THE BIRMINGHAM branch office of Asea Electric, Limited, reopened last Friday at 55, Temple Row, Birmingham, 2 (telephone: Midland 5695), with Mr. J. W. Percy as manager.

CLAYTON DEWANDRE COMPANY, LIMITED, Lincoln, announces that future dividend recommendations will be notified (approximately) during the first week in April and the annual meeting will be held early in May.

AN ADDITIONAL £1,000,000 for the Department of Scientific and Industrial Research is one of the main increases in the Civil Estimates for Trade, Industry, and Transport for 1949-50, published by H.M. Stationery Office on March 28.

THE WEEKLY average production of crude steel of Sheffield and district in January was 42,900 tons—900 tons more than the previous best, reached in September, 1948. The January average was also 2,800 tons a week higher than the figure for January, 1948.

ELEVEN EMPLOYEES of W. H. Dorman & Company, Limited, engineers, ironfounders, etc., of Stafford, received long-service certificates on April 1. This brings the membership of the company's "Over Twenty-five Club" (members must have had 25 years' service with the firm) to 152.

ACCLES & POLLOCK, LIMITED, Oldbury, a subsidiary of Tube Investments, Limited, has received a contract for 240,000 stainless-iron rock drill tubes and 84,000 tubes of chrome-alloy steel, valued at about £150,000, from the Union Steel Corporation (of South Africa), Limited, for gold mines.

JAMES BOOTH & COMPANY, LIMITED, non-ferrous metal manufacturers, etc., of Birmingham, announces that, owing to a technicality relating to the period of notice to be given, the meeting which was to have been held last Tuesday, will now take place at Birmingham on April 28 at 12.30 p.m.

IMPROVEMENTS IN THE foreign exchange position have enabled Canada to announce a considerable relaxation in import restrictions. The quota of cooking and heating equipment and many other things has been increased, while all restrictions have been removed on timber and on several manufactured articles.

AN IRON INGOT MOULD weighing 150 tons, and reported to be one of the largest in Europe, was recently despatched from the Brightside Foundry & Engineering Company, Limited, Sheffield, to Thomas Firth & John Brown, Limited, steel manufacturers, of Sheffield. The steel ingot from the mould will weigh over 200 tons.

A REDUCTION IN THE CAPITAL of the Sheepbridge Company, Limited, Chesterfield, from £1,750,000 to £890,035 by returning to the shareholders capital in excess of the wants of the company and cancelling liability on unissued shares was confirmed by Mr. Justice Roxburgh in the Chancery Division on March 28.

THE GENERAL ELECTRIC COMPANY, LIMITED, is to supply five new 30,000-kw., 10.5-kv., 3,000-r.p.m. turbo-alternators in connection with extensions to the Orlando Power Station, Johannesburg. The value of the contract exceeds £1,250,000. Three 37,500-kw. G.E.C. sets are already in service at the station, and two similar sets are under construction.

OVER 100,000 MAN-HOURS were saved last year at the Rotherham works of the Steel, Peech & Tozer branch of the United Steel Companies, Limited, by on-the-spot treatment at the company's first-aid station. On an average, each of the 6,500 employees had medical treatment at the works four times in 1948 and more than 45,000 re-dressings were performed.

THE HUNSLET ENGINE COMPANY, LIMITED, has received from the Mersey Docks and Harbour Board a repeat order for a 204-b.h.p. straight Diesel shunting locomotive similar to the 27-ton six-wheel locomotive which has been working successfully in the Liverpool docks area since April, 1944. Hunslet transmission and a Gardner engine are to be incorporated.

TRADING WITH THE ENEMY restrictions on the sending of money to Germany have been relaxed. The Treasury announces that remittances to the British, United States and French zones of Germany and to the British, United States and French sectors of Berlin are now subject to normal Exchange Control permission. Persons wishing to make such remittances are invited to consult their bankers.

THE POWER-GAS CORPORATION, LIMITED, Stockton-on-Tees, has endowed an open scholarship, tenable at Durham University, to enable suitably qualified students to undertake a course of study, leading to a degree, in either civil or mechanical engineering. The scholarship will normally be tenable for a period of three years, but, in exceptional cases, it may be extended for a fourth year.

AVELING-BARFORD, LIMITED, manufacturers of road machinery, dairy and cooking apparatus, etc., of Grantham, proposes to offer the whole of the 500,000 5 per cent. second cumulative preference shares recently authorised to holders of existing preference and ordinary stock for cash at par. The proceeds will be used to pay off the present overdraft with the bankers and to increase the cash resources.

LOCOMOTIVE REPAIR WORK which has been carried on at the Scotswood Works (Newcastle-upon-Tyne) of Vickers-Armstrongs, Limited, for about two years ended last week; alternative work is to be provided. It is reported that this fresh work will not employ the same numbers as locomotive work and, consequently, a small number of men has been paid off. Some of these have been found employment at Vickers' Elswick Works.

PLANS FOR THE FOUNDATION of a great Museum of Science and Industry were taking shape in Birmingham, said Mr. Trenchard Cox, Director of the Birmingham City Museum and Art Gallery, when he addressed the Royal Society of Arts in London. In the far distant future, he said, it should be the equal of those in Stockholm and Chicago. Birmingham was also arranging a

small exhibition of regional arts and crafts in a museum in one of the public parks.

THE DIRECTORS of the Ransome & Marles Bearing Company, Limited, are increasing their authorised capital to £1,000,000, and propose offering stockholders "at the first favourable opportunity" 400,000 new 5s. shares. The issue, they state, would recoup a large part of the capital expenditure incurred over past years and now contemplated, besides providing cash to finance increased output. The price of the issue has not yet been fixed. The existing capital, fully issued, consists of £700,000 in £1 stock units. It is intended to convert these into 5s. shares so as to make a freer market.

UNDER A CENTRALISATION PLAN for closer working of its interests, Wright & Platt, Limited, Birmingham, which claims to be the world's biggest manufacturers of engineers' patterns, is bringing two of its subsidiary firms from Halifax to Birmingham. A new foundry is now under construction adjoining the works of the parent company in Irving Street, Birmingham. Further extensions will have to remain in abeyance till the firm, which is affected by the inner-ring road scheme, is offered an alternative site by the Corporation. The Halifax concerns making the move are Wade & McGrath and Lloyd & Hargreaves, Limited.

THE GOVERNING BODY of Manchester Municipal College of Technology is offering six scholarships and six exhibitions varying in value up to a maximum of £65 plus approved fees if resident at home, and £140 plus approved fees if resident in hostel or lodgings, according to the financial family circumstances of the student, to part-time students and others, tenable in any one of the full-time day courses of the College for three academic years, on condition that persons holding these scholarships prepare themselves for the B.Sc.Tech. degree. Details may be obtained from the Registrar of the College of Technology, Manchester, 1.

AN OPEN-HEARTH STEEL FURNACE at the Redbourne (Scunthorpe) works of Richard Thomas & Baldwins, Limited, has been demolished and a new one built in 27 days—a performance believed by the company to be a world record for the man-hours worked. It is one of five experimental furnaces commissioned by firms in co-operation with the British Iron and Steel Research Association. A feature of the furnace is the suspended roof, which has permitted a design embodying the latest results of research on air and flows. It went into production on March 28 and is expected to produce 1,400 tons a week, 300 tons more than the previous one and of better quality.

THE DIRECTORS OF Sentinel (Shrewsbury, Limited (a subsidiary of Metal Industries, Limited), announce their decision that further capital of a permanent nature should be raised, and consent has been obtained to the issue of £840,000 of ordinary shares, which would make the issued ordinary £910,000. It is proposed that the existing share capital, consisting of 6 per cent. cumulative preference shares of 6s. each and ordinary shares of 2s. each, should be consolidated into 6 per cent. cumulative preference and ordinary shares respectively of £1 each, and that new articles of association should be adopted. An extra-ordinary general meeting was held on Tuesday.

European Steel Plan

Aid for Expansion and Modernisation

It was announced in Paris on March 27 that the Economic Co-operation Administration has accepted a $300,000,000 (£75,000,000) co-ordinated programme for expanding and modernising the Western European steel industry. The first phase of the programme covers 20 projects in eight countries and calls for the use of one-third of the total amount of E.C.A. funds to buy modern ore-mining and rolling-mill equipment.

Subject to Washington approval being forthcoming, the South Wales project will get more than $26,000,000 (£6,500,000), and Stewarts and Lloyds, Limited, more than $4,500,000 (£1,125,000).

The scheme has been welcomed by the Chancellor of the Exchequer. Speaking on March 28, Sir Stafford Cripps said he thought it was good that so many countries should agree on matters so vital to their economy. It was easy to agree on matters of general principle, but this agreement was a specific undertaking and was a valuable asset to the future of European co-operation. He thought oil refining and agriculture might be among the next industries to be looked into by the Organisation for European Economic Co-operation for the purpose of co-ordinating plans.

Scottish Industries Exhibition

Plans to represent all of Scotland's traditional and many new industries were disclosed at a London Press conference on March 31, which was attended by the Secretary of State for Scotland. Speaking of the Scottish Industries Exhibition to be held in Glasgow from September 1 to 17, Sir Steven Bilsland, Bt., president of the Scottish Council (Development & Industry), said that the exhibition sought to emphasise the value of Scottish production. Fifty per cent. of Britain's steam-raising plant, 45 per cent. of her locomotives and one-seventh of the national crude steel output came from Scotland, said the speaker, and the Glasgow exhibition would bring this to the notice of overseas buyers.

The exhibition, for which the whole two miles of sites is already fully booked, is not in any way intended to clash with British Industries Fair, said an official.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

GLASGOW, April 16—Supply of castings, iron and steel, etc., for the Town Council. The General Manager, Water Department, 50, John Street, Glasgow.

KILKEEL, April 13—Providing and laying 5,450 yds. of 4-in. Staveley's metal-spun Class C pipes and joints, etc., for the Rural District Council. The Boardroom, Rural District Council, Kilkeel.

John Lysaght's Scunthorpe Works

F.C.I. Finance for Extensions

Finance for extensions to John Lysaght's Scunthorpe Works is to be provided by the Finance Corporation for Industry. Total expenditure on these extensions, together with additional working capital, will be not less than £10,500,000, and it is stated that the provision of the finance was, therefore, a matter of grave consideration in view of the nationalisation proposals of the Government. However, the finances have been provided entirely from private sources by the Finance Corporation for Industry, which has agreed to advance sums by way of loans in instalments, amounting in all to £11,000,000.

By an amendment during the Committee stage of the Iron and Steel Bill, the name of John Lysaght, Limited, was removed from the Bill; its subsidiary company, John Lysaght's Scunthorpe Works, Limited, remains in the Bill. If nationalisation eventuates, then the Government, under the Bill, will be responsible for the repayment to the F.C.I. of the loans made up to that date and further financing of the scheme would then be the Government's responsibility. If nationalisation does not take place, the F.C.I. has the right to have part of its loans converted into debenture stock and preference shares with a view to making a public offer of such securities in due course, and Guest, Keen & Nettlefolds, Limited, the parent company of the group of which the Scunthorpe Company is a part, would subscribe in due course for preference shares and ordinary shares in the Scunthorpe Company.

The developments taking place at the Scunthorpe Works are on a large scale and form part of the development scheme laid down in the iron and steel industry's five-year plan for the expansion of production.

The Steel Company of Wales, Limited, was the first steel company in which the F.C.I. participated. The amount required was £50 million and the F.C.I. is providing £35 million. In November of last year the F.C.I. agreed to advance £3,200,000 to the Round Oak Steel Works, Limited.

Ministry of Supply Auction Sales

The following are among forthcoming auction sales announced by the Ministry of Supply. Names and addresses of the auctioneers are given in parentheses; catalogues (6d. each) may be had on application to them.

APRIL 21-22—General engineering and electrical plant and equipment, at M.O.S. Depot 151, Wing Airfield, Aylesbury, Bucks. (W. Brown & Company, 34, Market Square, Aylesbury.)

APRIL 26-29—Depot plant and equipment, small tools, etc., at M.O.S. Depot, Camelford, near Launceston, Cornwall. (J. Kittow & Son, Auction and Estate Offices, Launceston.)

A WIDE RANGE of industries will be represented at the Leicester and Leicestershire Industries Exhibition and Trade Fair to be held at the Granby Halls, Leicester, from May 19-28.

Welsh Industry

Unemployment Problem

Speaking on March 25 at the opening session of a convention organised by the Industrial Association of Wales at Llandrindod Wells, Mr. W. Clayton Russon, retiring president of the Association, commented on the Welsh unemployment problem. "We still think that the percentage of unemployed is too high compared with the rest of the country," he said. "We have been trying to see what we can do to assist the Government. We are examining the position to see what we can do not only to reduce the percentage of unemployed, but also to stop migration."

They had brought new industries to Wales, stated Mr. Russon, but they found it difficult to get key workers. They were not there because the new industries were not there before. They were setting up a new sub-committee to submit plans to the Welsh Board for Industry, or the appropriate Government department, asking that legislation be introduced to provide for housing for key workers completely independent of the local authorities' normal scheme.

Mr. Russon claimed that goods made in Wales were the best in the world. Welsh industry could completely satisfy the needs of the people anywhere, he said.

Mr. T. R. Martin, who was elected president of the Association for the coming year, said he viewed the general industrial situation with grave concern, but at the same time he felt they should be optimistic. He believed they could look to the future with optimism because they had been fortunate in acquiring so many stable and well-established firms in Wales.

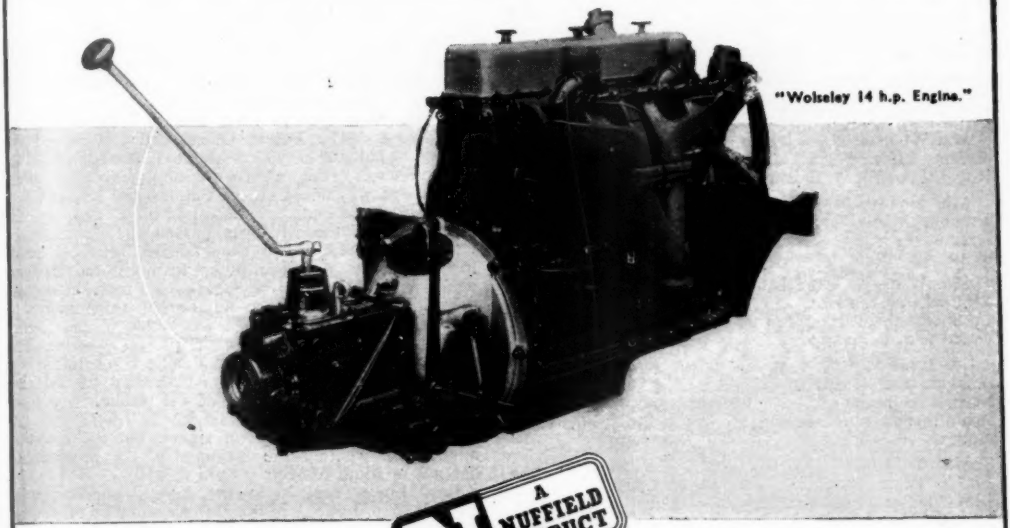
Chrome Ore Selling Prices

The following selling prices for chrome, which include carriage charges to nearest rail point consumers' works, apply for despatches effected as from April 1:—

REFRACTORY GRADES.—Rhodesian Imperial grade, £10 13s. 6d. per ton, ex-ship (£11 10s. 6d. per ton, ex-store); Transvaal, basis 40 per cent., scale 1s. 6d., £7 10s. 6d. (£8 8s. 9d.); Transvaal, basis 44 per cent., scale 1s. 6d., £8 15s. per ton, ex-store; Indian, basis 40 per cent., scale 1s. 6d., £9 19s. per ton, ex-store; Philippine, £8 5s. per ton, ex-ship (£9 1s. 6d. per ton, ex-store); Turkish, basis 40 per cent., scale 5s., £10 13s. 9d. (£11 10s. 9d.); Turkish, basis 43 per cent., scale 5s., £11 12s. 3d. (£12 9s. 6d.).

METALLURGICAL GRADES.—Rhodesian lumpy, £10 18s. 9d. (£11 14s.); Baluchistan, £11 11s. 9d. (£12 7s.); Rhodesian washed concentrates, £10 4s. 6d. (£12 2s. 6d.).

CHEMICAL GRADES.—Transvaal X.L., basis 50 per cent. scale 2s. 6d. above 50 per cent., £10 19s. 9d. (£11 19s.); Transvaal "A," basis 48 per cent., scale 2s. 6d. above 48 per cent., £9 14s. 9d. (£10 13s. 9d.); Transvaal "B," basis 48 per cent., scale 2s. 6d., £9 8s. 9d. (£10 7s. 6d.); Transvaal "C," basis 46 per cent., scale 2s. 6d., £9 1s. 9d. (£10 0s. 6d.); Rhodesian Dyke chemical, £11 0s. 6d. (£11 15s. 9d.); Rhodesian Lalapansi, basis 48 per cent., scale 2s. 6d. above 48 per cent., £10 5s. 9d. (£11 5s.); Baluchistan, £11 11s. 9d. (£12 7s.).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Obituary

MR. HENRY FRASER, principal of Douglas Fraser & Sons, Limited, engineers and ironfounders, of Arbroath, has died at the age of 62.

MR. FRED WOOLLEY, who has died at Southampton, was on the board of a number of companies, including Oddie Lock Nuts, Limited, Eastleigh, Hants.

MR. WILLIAM DEAN BATES, chairman of W. D. Bates & Son, Limited, iron and steel stockholders, of Park Royal, London, W.3, died on March 17. He was 73.

MR. HARRY PICKSTONE, a director and secretary of Bradbury, Saunders, Limited, textile engineers and non-ferrous metal founders, of Radcliffe, Lancs, has died at the age of 56.

MR. HAROLD JACKSON, of Mellowes & Company, Limited, metal sash and casement manufacturers, etc., of Sheffield, died on March 21. He had been associated with the company for 49 years.

DR. JOHN MORROW, whose death has occurred in London, was Reader in Engineering at King's College, Newcastle-upon-Tyne, for 34 years and a pioneer in steam-turbine development. He retired about nine years ago.

MR. R. MORRIS, who has died at the age of 73, was for 30 years managing director of Carr & Nichols, Limited, nut and bolt manufacturers, of Atherton, Lancs. He was also a director of Staveleys, Limited, structural engineers, etc., of Atherton.

MR. H. C. GRADWELL, a director of the Darlington Forge, Limited (controlled by the English Steel Corporation, Limited), died recently. Mr. Gradwell was appointed Yorkshire representative of the English Steel Corporation in 1930 and later supervised the company's sales at Darlington. He was associated with the company for over 50 years.

MR. JOSEPH H. L. TREVORROW, a director of the Chesterfield Tube Company, Limited, and Tube Investments, Limited, died on March 25, at the age of 74. Mr. Trevorrow joined the company in 1908 and has been its deputy chairman and managing director. He was awarded the C.B.E. in 1946 in recognition of his assistance to the Admiralty and other Government departments during the two wars.

Price of Virgin Aluminium Increased

The price of virgin aluminium in ingot form has been increased, with effect from April 1, from £87 to £90 per long ton, delivered consumers' works, with an addition of £2 10s. per ton for metal in notch-bar form. The new price applies to metal of a purity of 99 to 99.5 per cent. inclusive, and the existing premiums for higher purities will be payable in addition as follows:—Minimum 99.6 per cent., £8 per ton; 99.7 per cent., £12; 99.8 per cent., £17; 99.9 per cent., £50; 99.99 per cent., £100. The price change is due to an increase in the cost of imported supplies.

Patents and Designs Bill

Meeting Modern Requirements

The Patents and Designs Bill was read a second time in the House of Lords on March 29.

Lord Lucas, Lord in Waiting, moved the second reading of the Bill, which, he said, sought to bring into line with modern requirements the law relating to patents. The Patent Office had just issued the millionth patent, of which about 90,000 remained in force to-day. The modern use of patents and industrial design was based on the Patents and Designs Act, 1907, and since that date there had been seven amending Acts. If the Bill was passed the Government intended to present two consolidated Bills, one relating to patents and the other to registered designs, which in future would be separate statutes. Although the Bill contained a large number of amendments to the existing law, no change was made in the fundamental principles of the present patents system. The new system would encourage a better and fuller disclosure of inventions and the best way of working them to the ultimate benefit of the public.

Lord Simon said it was right to revise the law relating to abuses of patent rights, but the question might arise whether the language of the present Bill did not in some respects go too far.

Lord Lucas, replying to the debate, hoped that as a result of provisions in the Bill the number of patents cases which went to the Court of Appeal would be greatly reduced.

Iron and Steel Board

To be Succeeded by New M.O.S. Division

It was announced on October 1, 1948, that the members of the Iron and Steel Board, with the exception of the trade union members, were unable to accept the invitation of the Minister of Supply to serve a further year in the changed circumstances likely in their view to arise from the Government's proposals for bringing sections of the iron and steel industry under public ownership. It was, however, also announced that the Board would continue in office pending completion of its work on certain outstanding major problems then in hand. The Board now feels that this work has been completed as far as practicable. Accordingly, the appointment of the Board terminated on March 31.

The executive work previously carried out under the Board will be performed by a division of the Ministry of Supply to be known as the Iron and Steel Division. That division will be in the charge of an under-secretary and will be staffed by those previously serving the Iron and Steel Board. Matters connected with the Iron and Steel Bill will continue to be dealt with by a separate division of the Ministry.

PARAMOUNT ALLOYS, LIMITED, Slough, has appointed Padley & Venables, Limited, Suprex Works, Livery Street, Birmingham, 3, as its agents for stainless-steel castings in the Birmingham area.

"HARTLEY" MOULD DRYER

6 advantages

★ Fuel Consumption is about half that of old methods

★ Simple to control by only two valves, making it almost impossible to damage the Dryer by overheating.

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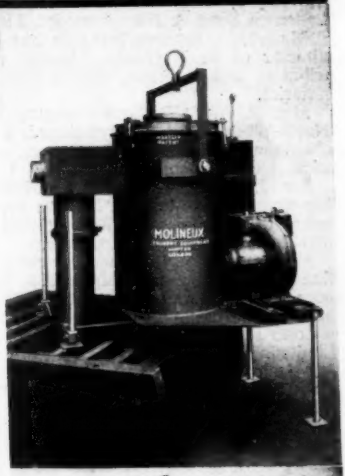
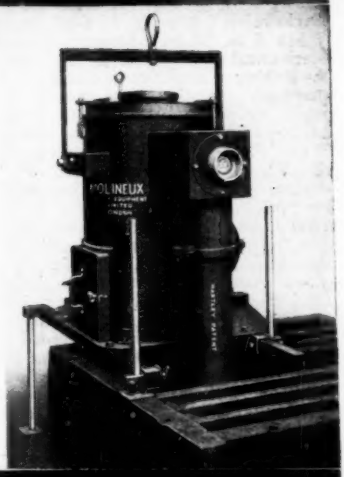
★ Totally enclosed fan and motor

★ Lifting them by crane hook alone no slings or chains required.

★ Hot air delivery pipe fitted outside body making it easily accessible.





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Personal

MR. R. A. CHALMERS, who has been a director since 1936, is resigning from the board of Switchgear & Cowans, Limited, Manchester.

MR. PHILIP R. MOSSAY, works superintendent at Manchester since 1935, has been appointed a director of Laurence Scott & Electromotors, Limited.

MR. A. F. PALMER PHILLIPS has been appointed a director of Braid Group, Limited, motor-vehicle distributors and engineers, and its principal trading subsidiaries.

MR. R. A. S. THWAITES, deputy chairman of the North-Western Electricity Board, has been elected chairman for 1949-50 of the Council of the British Electrical Development Association.

MR. J. PHILLIPS has been appointed deputy managing director and MR. J. J. LEE has been co-opted to the board of Tweedales & Smalley (1920), Limited, textile-machinery makers, of Rochdale.

MR. JAMES YOUNG, general secretary of the Association of Engineers and Shipbuilding Draughtsmen, has been elected chairman, in place of MR. G. HITCHINGS, of the Amalgamated Engineering Union.

LORD ROTHERWICK, chairman of Clan Line Steamers, Limited, and other companies, was elected president for the ensuing session at the annual meeting of the Institute of Marine Engineers on March 29.

MR. J. SMITH has joined the staff of Berry Hill Plant Division (Berry Hill (Engineers), Limited), and has been appointed chief engineer of the company. He was previously chief draughtsman of the Oilwell Engineering Company, Limited, Stockport.

MR. S. G. DEAVES, formerly manager of the northern mechanical sales division at Leyland of the British Tyre & Rubber Company, Limited, is to be belting sales manager, operating from the head office in London, while MR. G. W. WILLIAMS is to be northern manager of the industrial sales division, operating from Leyland.

MR. F. C. KNOWLES becomes a director of Evershed & Vignoles, Limited, electrical and mechanical engineers, of Chiswick, London, W.4, on retiring from his position as sales manager. He joined the firm in 1900 and has been sales manager for the past 26 years. MR. W. A. SHAW, his chief assistant for many years, succeeds him as sales manager.

SIR ARCHIBALD JAMIESON, chairman of Vickers, Limited, since April, 1937, has retired from the board on reaching the normal age limit of 65 for executive directors. He will be succeeded by LT.-GEN. SIR RONALD WEEKS. MAJOR-GEN. SIR JOHN DAVIDSON has also retired from the board, while LORD HAILEY will retire on April 30, both having passed the age of 70.

LORD MCGOWAN, chairman of Imperial Chemical Industries, Limited, the RT. HON. OLIVER LYTTELTON, M.P., chairman of Associated Electrical Industries, Limited, MR. GEORGE F. EARLE, chairman and managing director of Associated Portland Cement Manufacturers, Limited, and SIR ROBERT SINCLAIR, president-elect of the Federation of British Industries and chairman of the Imperial Tobacco Company, Limited, have been elected vice-presidents of the Institute of Directors.

Increases of Capital

Details of increased capital have been announced by the following companies:—

MANSFIELD MAXTON, LIMITED, hydraulic, etc., engineers, of London, S.W.1, increased by £10,000, in 6,250 6 per cent. preference and 3,750 ordinary shares of £1 each, beyond the registered capital of £10,000.

ZIRCONAL, LIMITED, manufacturers of refractory articles, engineers, etc., of London, E.C.4, increased by £12,000, in £1 5 per cent. redeemable non-cumulative preference shares of £1, beyond the registered capital of £1,000.

LOWTON CONSTRUCTION COMPANY, LTD., iron and steel merchants, ironfounders, etc., of Lowton St. Mary's, near Warrington, increased by £15,000, in £1 ordinary shares, beyond the registered capital of £5,000.

NEWMAN, HENDER & COMPANY, LIMITED, manufacturers of brass, gunmetal, iron and steel valves, etc., of Woodchester, near Stroud, Glos, increased by £150,000, in 125,000 5½ per cent. cumulative preference shares of £1 and 50,000 ordinary shares of 10s. each, beyond the registered capital of £250,000. The existing 175,000 ordinary shares of £1 each have been sub-divided into two ordinary shares of 10s. each.

Working Conditions in Foundries

In the House of Commons, last Thursday, Mr. Dumpleton asked the Minister of Labour what further steps were contemplated to bring the working conditions in all foundries up to the standards recommended in the report of the Joint Advisory Committee on Conditions in Ironfoundries.

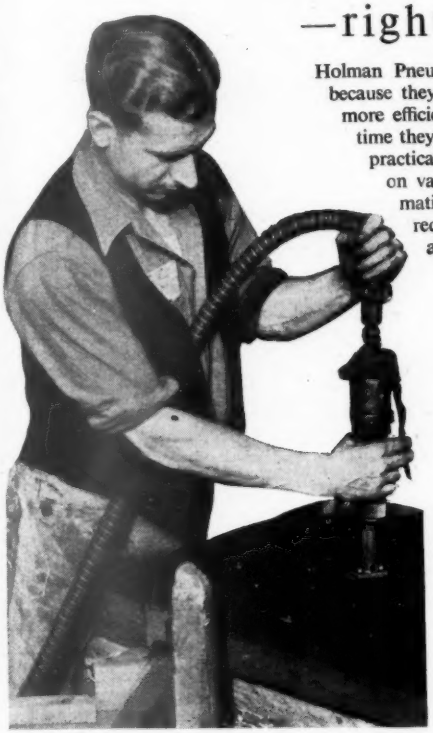
In reply, Mr. Isaacs said that this was a matter for detailed action by employers and workers in the industry. This action included structural and other alterations varying according to the circumstances of particular foundries, and the steps already taken and contemplated could not be described within the limits of an answer to a Parliamentary question. As indicated, however, in a booklet just issued by the Amalgamated Union of Foundry Workers, considerable progress had been made in spite of serious practical difficulties. Factory inspectors were giving special attention to the matter, and the position was under constant review by the Joint Standing Committee on Foundry Conditions.

Substitution of Wood for Steel

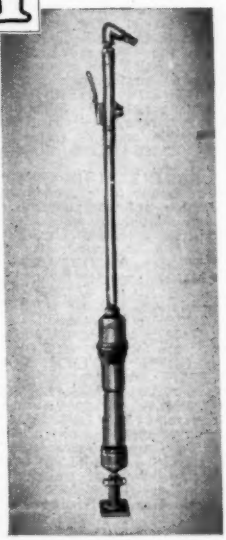
A subject in the minds of them all was that of the substitution between timber and other materials, especially steel, said Mr. Harold Wilson, President of the Board of Trade, speaking at the annual dinner of the Timber Trade Federation. He hoped the decontrol of hardwood would speed the process. The softwood supply position was more difficult, but even though dollar softwood might be involved, some re-substitution of timber for steel would undoubtedly be in the country's economic interest. During the war, and after, when timber imports had to be severely restricted, the substitution of steel for timber was pushed hard.

The Timber Development Association had produced a booklet on the case for putting this process into reverse, said Mr. Wilson, and he had asked a number of Government departments and steel users to review its proposals.

Holman Pneumatic Rammers —right on top of the job



Holman Pneumatic Rammers are welcomed by workers in many industries because they cut out the toil of packing loose materials, doing the job far more efficiently and quickly than it can be done by hand. At the same time they please managements because they save time and labour and are practically foolproof. Their special feature is their effectiveness even on varying levels of material, the piston stroke adjusting itself automatically. The range covers almost all "bench" and "floor" requirements, and various sizes and shapes of butts and peins are available. Full details and recommendations supplied on request.



Bench Type : Sizes 0 and 10

Floor Type : Sizes 20 and 30

Type	Size	Length ins.	Weight lbs.
Bench ...	0	17	9
Bench ...	10	23	18
Floor ...	20	48	22
Floor ...	30	47	27

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SUBSIDIARY COMPANIES, BRANCHES AND AGENCIES THROUGHOUT THE WORLD

H.13

Company News

(Figures for previous year in brackets.)

RADIATION—Dividend of 12½% (same).

A.C.E. MACHINERY—Dividend of 20% (15%).

FEDERATED FOUNDRIES—Dividend of 10% (5%).

WAYGOOD-OTIS—Final dividend of 5% (nil), making 25% (17½%).

JAMES HOWDEN & COMPANY—Interim dividend of 7½% (same).

GLYNWED TUBES—Final dividend of 12½%, making 25% (same).

MERCANTILE DRY DOCK COMPANY—Dividend of 8% (same).

BRUCE PEEBLES & COMPANY—Dividend of 10% (5% and bonus of 5%).

ENFIELD ROLLING MILLS—Dividend of 5% (same) and bonus of 2½% (same).

ROBERT STEPHENSON & HAWTHORNS—Dividend of 5% and bonus of 2% (same).

SKEFKO BALL BEARING COMPANY—Final dividend of 11⅔%, making 16⅔% (same).

LEEDS FIRECLAY COMPANY—Interim dividend of 3% on the preferred ordinary shares (same).

SWAN, HUNTER & WIGHAM RICHARDSON—Final dividend of 8% and bonus of 4%, making 16% (same).

BRITISH ROLLMAKERS' CORPORATION—Dividend of 15% (same). The new shares rank for a half-year's dividend.

A. C. COSSOR—The directors state that the trading results for the year ended March 31, 1949, are such that it is not possible to recommend the payment of a dividend on the 6% preference shares.

GEORGE WOSTENHOLM & SON—Trading profit for 1948, £12,214 (£10,232); other income, £656 (£1,132 including £512 E.P.T. repayable); to directors' remuneration, £4,119 (£4,201); depreciation, £500 (same); taxation, £4,286 (£3,951); net profit, £3,965 (£2,712); dividend of 10% (same); forward, £7,054 (£7,854).

ENGINEERING COMPONENTS—Final dividend of 15% and bonus of 5%, making 30% (same). Pending receipt of further information from the subsidiary in Australia, the consolidated accounts cannot be finally completed, but they will show combined trading profits of approximately £235,000 for 1948, compared with £270,930 for 1947.

WILDT & COMPANY—Trading profit for 1948, £289,993 (£137,179); sundry revenue, £1,105 (£2,558); to directors' emoluments, £14,160 (£7,906); auditors' fees, £1,150 (£1,130); depreciation, £21,258 (£21,636); profit, before tax, £254,530 (£110,065); brought in, £41,251 (£11,832); to tax, £134,344 (£39,121); written off goodwill, £2,500 (nil); dividend of 50% (same); forward, £117,412.

NORTH BRITISH LOCOMOTIVE COMPANY—Trading (£3,776); to depreciation, £75,000 (£50,000); directors' remuneration, £17,876 (£13,999); tax, £221,881 (£131,000); net profit, £182,949 (£124,845); brought in, £61,184 (£51,340); to general reserve, £4,323 (£60,000); capital replacement and development reserve, £92,000 (nil); benefit fund, £25,000 (nil); dividend of 5% (same); forward, £67,810.

DAVIS & TIMMINS—Group net profit for 1948, after depreciation, deferred repairs and taxation, £60,082 (£59,742), including £4,396 (£10,225); provision for E.P.T. no longer required, and allowing for deferred repairs £24,500 (£4,558); final dividend of 20% and bonus of 10%, making 40% (same); to pensions funds, £4,000 (same); general reserve, £3,892 (nil); goodwill, £19,725 (nil); stock contingencies reserve, nil (£25,000); forward, £97,334 (£93,194).

BRAID GROUP—In announcing that no final ordinary dividend is to be added to the interim dividend of 7½% already paid for the year to September 30, 1948, the board states that group profits have fallen very substantially short of those anticipated. In May last it was stated that results for the first six months of the financial year were entirely satisfactory, the turnover having exceeded £1,000,000. Last year's interim dividend of 7½% was followed by a final payment of 10%.

WEBLEY & SCOTT—Trading balance for 1948, £59,986 (£34,453); other income, £1,946 (£1,643); to depreciation, £5,304 (£4,868); directors' emoluments, £3,839 (£2,603); auditors' remuneration, £350 (same); income tax, £20,722 (£8,476); profits tax, £5,000 (£4,750); leaving £26,717 (£15,049); brought in, £49,150 (£36,035); provisions in excess of requirements, £4,607 (£8,857); available, £80,474 (£59,941); to benevolent fund, £2,745 (nil); investment reserve, nil (£2,500); dividend of 15% and bonus of 5% (same); forward, £69,438.

BRITISH TAP & DIE (HOLDINGS) (incorporated June, 1948)—Consolidated accounts for the period June 9 to December 31, 1948, show net trading profit, £89,177; net trade investment dividend, £6; to audit, £499; directors' emoluments, £7,700; depreciation and amounts written off, £5,747; leaving £75,237; to staff participation, £5,145; tax, £37,800; preliminary expenses, £1,727; transfer to goodwill, £14,989, being proportion of subsidiary's net profit for the year; attributable to pre-acquisition period, £32,849; parent company's dividend, net, £10,835; forward, £4,741.

GLOVER & MAIN—Consolidated trading profit for 1948, £623,249 (£445,610); to depreciation, £55,447 (£25,336); audit, £1,246 (£1,158); directors' emoluments, £20,409 (£16,657); leaving £546,147 (£401,959); investment income (gross), £23,082 (£23,534); net profit, £569,229 (£425,493); to profits tax, £73,064 (£72,660); U.K. income tax, etc., £230,771 (£191,034); net profit of group, £265,394 (£161,799); adjustments relating to previous years, £20,117 (£94,860); to profits retained in subsidiaries, £183,599 (£168,537); special depreciation, £35,000 (nil); net profit of holding company, £66,912 (£88,122); brought in, £79,014 (£48,367); preference dividend, £1,788; final ordinary dividend of 10% and bonus of 7½%, making 22½% (same); forward, £88,461 (£79,014).

HILGER & WATTS—The first report (the company was incorporated in February, 1948) shows trading profits for the periods ended September 30, 1948—comprising Adam Hilger, Limited, for the period October 1, 1947, to February 19, 1948, E. R. Watts & Son, January 1 to February 19, 1948; Hilger & Watts, February 20 to September 30, 1948; and subsidiary for the six months ended September 30, 1948—of £107,733; to interest, £4,934; audit, £802; directors' fees, £186; salaries and commission, £20,865; depreciation, £15,457; profits tax, £9,500; income tax, £27,000; loss of subsidiary for March, £195; net profits prior to incorporation transferred to capital reserve, £14,000; net profit for the seven months ended September 30, £14,794; preference dividend, £3,008; ordinary dividend of 6% per annum, £4,331; profit of subsidiary retained, £590; forward (Hilger & Watts), £6,865.

THOMAS BOLTON & SONS—Trading profit and sundry receipts for the nine months ended December 31, 1948, £284,853 (£352,669 for 12 months, including sundry revenue); to directors' emoluments, £7,991 (£10,779); depreciation, £50,005 (£65,990); debenture interest, £12,416 (£16,785); fixed loan interest, £1,154 (£1,637); profits tax, £31,093 (£32,551); debenture sinking fund, £4,082 (£5,209); second preference redemption reserve, £1,000 (nil); underwriting commission, £1,500 (nil); issue expenses, £110 (nil); leaving £175,502 (£219,718); brought in, £99,345 (£72,422); transferred from contingencies reserve, nil (£133); to tax, £104,563 (£87,178); first preference dividend, £4,125 (£8,250); second preference dividend, £5,956 (nil); final ordinary dividend of 5%, making 7½% for nine months (7½%, plus bonus of 2½% for 12 months), £20,625 (£27,500); general reserve, £29,000 (£70,000); forward, £110,576.

BRITISH ALUMINIUM COMPANY—Consolidated trading profit after management remuneration in 1948, £1,345,677 (£2,341,944 after additional reserve for future fluctuations in stock prices); investment income, £103,031 (£40,723); profits on sales of trade investments, £140,265 (nil); to depreciation, £345,360 (£346,023); amortisation of leases, £30,000 (£42,587); reserve for increased cost of plant replacements, £250,000 (nil); debenture interest, £105,000 (£129,780); loan interest, £4,152 (£11,614); deferred repairs, £50,000 (£150,000); superannuation fund, £20,891 (£22,116); audit fees, £2,542; tax, £782,578 (£1,205,948); net profit, £498,450 (£474,596); profits to outside shareholders, £2,369 (£1,533); net profit attributable to parent company, £496,081 (£476,129); brought in, £658,284 (£628,852); available, £1,154,365 (£1,104,981); to general reserves, £204,600 (£201,347); final dividend of 5% making 10% (same); contingencies reserve, £35,522; forward, £700,343.

Changes of Name

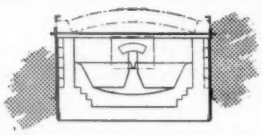
The following companies have recently changed their names, the new titles being given in parentheses:—

SUMEX SALES, LIMITED, mechanical and general engineers, etc., of Ashford, Middx (Sumex Engineering Products, Limited).

BLACKFORD & VEALE, LIMITED (formerly Rosis & Blackford, Limited), workers in metals, etc., of Sutton (Cliveden Tool & Gauge Company, Limited).

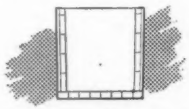
BRITAINS BEST BASIC REFRACTORIES

G·R '341' DOLOMITE BRICK

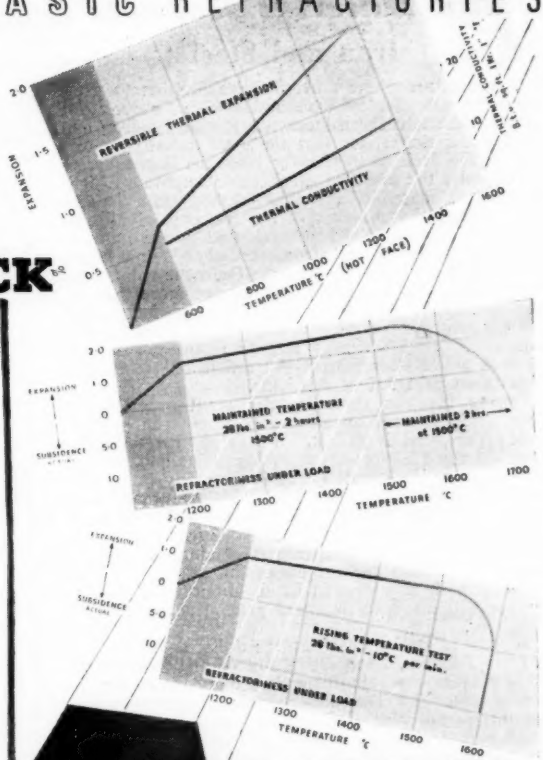


ELECTRIC FURNACES G.R. '341' dolomite bricks are used extensively in walls and bottoms of basic electric arc furnaces. Proved the most economic basic brick available. Complete absence of chromic oxide makes '341' most suited for production of chromium-free alloys. Any size furnace can be lined from standard stock sizes.

BASIC BESSEMER CONVERTER G.R. '341' bricks, dense and burnt to vitrification at high temperatures are superior to rammed tarred dolomite or 'green' tarred blocks in the lower wall positions. In addition to giving much longer and uniform life to the converter the efficiency of the process is greatly improved. Highly resistant to chemical erosion and mechanical attrition.



DESULPHURISING LADLES G.R. '341' bricks provide the perfect lining and solve completely the refractory problems connected with sulphur removal by the sodium-carbonate process. Give a life 8 to 10 times longer than firebrick without patching or attention. A perfect chemical (basic) medium which in addition to longer lining life increases efficiency of process.



The widespread and successful use of the G.R. '341' dolomite brick in Basic Electric Furnaces, Bessemer Converters and Desulphurising Ladles is one of the major achievements in refractories. G.R. '341', the result of many years research and experimentation, is manufactured entirely from British Dolomite and is treated to ensure resistance to atmospheric moisture. Like all G.R. Basic Bricks, '341' is made in one of the most modern plants, embodying all the features of improved brickmaking technique and possessing valuable characteristics developed by years of experience. Full information and advice on the selection and application of refractories will be given on request.

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Raw Material Markets

Iron and Steel

Commenting on the Government's decision to withdraw the subsidies on iron and steel, as a result of which prices have been increased, the British Iron and Steel Federation states that the steel industry readily accepts the decision to transfer from the Exchequer to the industry the so-called subsidies on imports of high-priced raw materials and semi-finished steel. "This change in policy means that the full cost of all raw materials and semi-finished steel used in the industry and brought into Britain from abroad will now be reflected in British steel prices," the Federation statement continues. "Even so, they will be not more than 87 per cent. above pre-war, compared with an increase of 140 per cent. for industrial materials and manufactures generally. They will also still be below the general level of world steel prices. An article on the subject appears on page 321 of this issue.

During the past three months, scant progress has been made towards an expansion of pig-iron production. The need is urgent. Stocks at the foundries have dwindled almost to vanishing point and current deliveries are inadequate. Nor is there any immediate prospect of increased allocations. Blast-furnace outputs are passing promptly into consumption, but all grades are scarce, the shortage of No. 3 iron being most pronounced. Only refined iron is obtainable with any degree of freedom and makers of this grade have now an abundance of orders in hand. Imports of foreign ore are still disappointing, and prompt acceleration is called for.

Imports of steel semis from the dollar areas, as well as from Belgium, Luxemburg, France and the Netherlands bespeak the avid demand in this country for re-rolling material. The position has not deteriorated, but this is the best that can be said. Re-rollers of small bars and sheets cannot cope with the demand for their products, but could certainly achieve a further expansion of production if more liberal supplies of material were available. Good deliveries of slabs and the larger sizes of blooms and billets are coming to hand, but sheet bars and small billets are in short supply.

Rollers of steel plates cannot keep pace with a clamant home and overseas demand. Some of the sheet mills are providing assistance in rolling light plates, leaving the heavy plate mills free to cope with weightier material. But there are long waiting lists and capacity is not nearly sufficient to handle all the business on offer.

Non-ferrous Metals

As announced below, the Ministry of Supply has reduced its selling prices of both lead and zinc. A reduction in the lead quotation was fully expected in view of the fall in the American quotation. Two further reductions occurred in the United States price of lead last week, which brought the quotation down to 16 cents, or 5½ cents below the previous maintained level of 21½ cents. In the course of only a few days, therefore, there has been a reduction of about 25 per cent.—and that in the price of a metal which only a short time ago was said to be in extremely short supply. In the United Kingdom there are some who suggest that copper also should be brought down. It is true that the export price was quoted in New York at the end of last week at 23¼ to 23¾ f.a.s., but whether this modest cut is sufficient to persuade the Ministry that it ought to bring its quotation down is another matter. At £140 the electro price has, of course, been well above the world price for a long time past, and our fabricators are to that extent at a disadvantage in quoting for export orders. It has always been understood that the additional charge levied by the Ministry represented ocean freight, carriage to consumers' works, etc., together with something to cover the Ministry's expenses.

In spite of somewhat gloomy talk about the state of affairs in the non-ferrous industry, February's copper consumption kept up very well. Virgin copper amounted to 29,633 tons, compared with 28,504 tons in January, while secondary copper was 12,405 tons, against 15,847 tons. These figures are published by the British Bureau of Non-ferrous Metal Statistics, which also gives details of stocks at the end of February. These amounted to 105,132 tons, a drop of about 10,000 tons on the January figure, which, it will be remembered, stood at 115,349 tons. Stocks of zinc at 39,805 tons were virtually unchanged, while consumption amounted to 23,610 tons. Stocks of lead at the end of February were 21,286 tons, compared with 23,449 tons at January 31. Consumption of lead for the month of February, which included 10,839 tons of remelted lead and scrap, is given as 28,382 tons. Taken together, these details are certainly indicative of continued activity in non-ferrous metals, but now that the price structure has begun to crumble, confidence is shaken and consumers are inclined to adopt a hand-to-mouth buying policy.

Lead and Zinc Prices Reduced

The Ministry of Supply has announced lower prices for both lead and zinc. These reductions, effective from Monday last, are the first to be made since the Ministry assumed control of buying in 1939. The reduction in lead amounts to £17 per ton, from £123 to £106, while the zinc price is reduced by £5 per ton, from £106 to £101.

The new selling prices, per ton, delivered, are:—Good soft pig-lead, £106; good ordinary brand and "Prime Western" zinc, £101; refined electrolytic zinc, £101 15s.; not less than 99.99 per cent. pure zinc, £103 5s.

MR. C. H. DAVISON, managing director of Thomas Tinsley & Son, Limited, engineers and ironfounders, of Loftus, Yorks, has retired after 12 years' service with the firm. His place is being taken by MR. O. G. WILSON, a director and works manager of the firm.